

## EXPO 2000 HANNOVER - A CHALLENGE FOR ITS

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### SUMMARY

In the year 2000 the World Exhibition EXPO 2000 will take place in Hannover (Germany). For this event, approximately 20 mio. visitors are expected to come to Hannover, and due to multiple visits, the EXPO counts on more than 40 mio. entrance tickets to be purchased. This paper does not report on already realised telematic systems but on a comprehensive transport planning with some very interesting, unique aspects and on the role intelligent transport systems (ITS) can play at such mega-events. It details the different traffic management measures and telematic systems that are already planned (in June 1997) or that should be implemented. Since not every transport problem for the EXPO is already solved at this time, this paper is also a call for all interested parties to demonstrate advanced transport systems at the EXPO 2000 in Hannover.

### THE EVENT

The EXPO 2000 will take place in Hannover from the 1<sup>st</sup> of June until the 31<sup>st</sup> of October 2000 (153 days). The major theme of this exhibition will be „Mankind - Nature - Technology“, which also summarises major aspects of today's and tomorrow's transport planning and traffic engineering.

Hannover is the capital of the German state Lower-Saxony, wellknown world-wide mainly through the Hannover Fair. The EXPO will cover today's grounds of Hannover Fair and make full use of the infrastructure that is already available for large fairs. Viceversa, the EXPO is a key-event to improve the fair's infrastructure as well as the overall transport infrastructure in the Hannover region. **Figure 1** shows the location of the EXPO and the major elements of the transport infrastructure.

Approximately 20 mio. visitors are expected to come to the Hannover EXPO from all over the world. 10 mio. visitors should come from Germany, 8 mio. from other European countries, and 2 mio. from other continents. Due to multiple visits, the EXPO counts on more than 40 mio. entrance tickets to be purchased.

Traffic authorities in Hannover are preparing this event since several years now, coordinated by a working group with about 40 participants under the lead of the Lower-Saxony Ministry of Economy and Traffic. While infrastructure planning has been already finished to allow a realisation in time, the operational aspects are intensively dealt with during this last three years of preparation.

## **THE REQUIREMENTS ON THE TRANSPORT SYSTEM**

When organising an unique event like this World Exhibition, there is always a risk to underestimate the problems that might occur due to high traffic volumes and to a lack of experience. Serious problems in the areas of bus transit and passenger information during the 1996 Olympic Games in Atlanta are a popular example for this. Although Hannovers transport experts have a very good knowledge in handling traffic at large fairs (such as Hannovers Trade Fair and CEBIT with peaks of as much as 180.000 visitors per day), they are aware that the EXPO will have new dimensions in terms of number of visitors as well as in terms of the events duration. Failures in the organisation of transport systems strictly have to be avoided. A save and comfortable journey is a prerequisite for an attractive World Exhibition. Therefore, also the financial success of the EXPO depends very much on a well organised, reliable transport system with a sufficient capacity. In addition, the inhabitants of the Hannover region would not accept bad traffic conditions over a period of five months. And finally, the world visiting the EXPO should not only find a transport system which works sufficiently but they should also get a view of how mobility in the beginning of the next milleannium should be organised. For all these reasons, the use of all transport systems has to be optimised in a way

- that guarantees a save and comfortable journey for all visitors,
- that minimises negative impacts on the environment, the regular traffic, and the inhabitants in the Hannover area,
- that is economic and makes full use of available capacities in each transport system which vary over the day and over the whole event.

The goal is to achieve a modal split for visitors arriving at the Exhibition of approximately 12 % by long distance rail including high speed trains (ICE), 15 % by the regional Rail Rapi Transit (S-Bahn), 18 % by light rail, 30 % by choaches, city busses and taxis, and 25 % by car. Such transport planning for the EXPO requires an integrated, intermodal approach taking all the dynamic parameters into account which may vary during the event. And it is a challenge for intelligent transport planning as well as for new technologies to demonstrate their positive impacts.

## **THE INFRASTRUCTURE**

While today Hannover and the surrounding region already provide a good transport infrastructure, this will be improved until the year 2000 by several measures - of course, not for the EXPO alone but mainly for the regional development beyond that event. Basic measures to improve the infrastructure are:

- Reconstruction and extension of a ring-road around the fairground.
- Reconstruction of parking facilities at the fairground.
- Park and Ride facilities in the suburban area of Hannover.
- Extension of Hannovers light rail network.
- A new high speed rail (ICE) station at the fairground.
- A new Rail Rapi Transit (S-Bahn) for the region including a station at the fairground as well as at the airport.
- A third passenger terminal at Hannover airport.
- Extensions on some links of the autobahn (e.g. three instead of two lanes per direction).

## **THE TRANSPORT SYSTEM OPERATION AND THE ROLE OF ADVANCED TECHNOLOGIES**

### **Integrated Management of Ticketing and Transport Systems**

A very important decision in Hannover was - mainly with regard to the transport system infrastructure - to restrict the number of full-day visitors to app. 300.000 persons per day. Since normally the goal of 40 mio. visits within 153 days would lead approximately to a range from 150.000 to 600.000 visitors per day, this limitation requires a very intensive control of ticket sales:

- Full-day tickets must be valid for a specified day only or must be restricted to days with expected low demand. Their total number must be limited for each day.
- Additional visitors may be possible through the introduction of tickets which are valid only in the afternoon and evening (always considering the departure flows as well as the total capacity of the exhibition area itself which is currently designed for 300.000 people at the same time).
- All visitors should make a decision for a transport mode when buying an entrance ticket for the EXPO. While the use of regional public transport is always included in the entrance fee, special arrangements are made for car drivers. Each one of the rare parking spaces directly at the exhibition area is only available together with three full-day entrance tickets, and it will be necessary to make reservations for the EXPO Park+Ride facilities, as well. In addition, there will be special offers for bus and train journeys to the EXPO.
- As many tickets as possible should be purchased in advance of the visit. Ticket sales directly at the exhibition area should be reduced to a minimum. Under no circumstances it will be possible to buy a parking ticket at the exhibition area, since otherwise traffic flow could get out of control.

The time visitors will spend at the exhibition is part of the logical chain between arrival and departure of visitors. Therefore, this parameter is a very important circumstance of the EXPO which should and will be influenced by the events program. Basically, the duration of a visit may be about 7 hours in the average. The scheduling of major events on the exhibition area (e.g. fireworks in the evening), opening hours and allowed entrance time for different types of tickets should contribute to reduce peak flows of arriving and departing visitors as well as to minimise the overlapping of such peaks with those of the regular traffic in the Hannover region.

On the other hand, data from the world-wide advance sale of tickets starting in 1998 run together in one computer system and could be used to optimise the transport system operation. For each day, this includes the total number of tickets sold, the regions where these tickets have been sold, and information on the transport mode visitors have chosen, for example the number of reserved parking spaces or the number of tickets sold through German Rail (DB AG) and through companies for bus tours. Although all this data will not give a complete picture on the expected traffic volumes, it will allow some forecasts and enable the organisers to counteract wherever it is possible (e.g. concentrated marketing in some regions) and to be prepared for disturbances where it is necessary (e.g. signing of alternative routes or flexible scheduling of special EXPO trains). Appropriate simulation tools must be installed for this purpose. They will also be used to develop reasonable measures for different incident scenarios in advance.

## **Regional Public Transport**

The expected variations in the total number of visitors per day probably will not influence very much the number of cars arriving at the EXPO but mainly the use of the public transport systems. This requires a very flexible operation to adapt demand and supply for each day.

The light rail and bus system in Hannover is already equipped with a computerised operation and control system (COCS). The capacity of the regional Rail Rapit Transit will be further improved at the link between Hannovers main station and the EXPO station (Laatzen). Most modern trains from all over Germany should be used, and even other trains will be re-routed to provide sufficient capacity for EXPO visitors. Since Hannovers light rail system is expected to have a lower load than the regional Rail Rapit Transit (S-Bahn), the EXPO tries to acquire as many hotels and other overnight accomodations as possible to be reached by the light rail system.

Pre-trip and on-trip passenger information systems have an important role where EXPO visitors should be encouraged to use public transport. Hannovers collective on-trip information system will be improved. For pre-trip information the EFA computer system, which is already available via different media, comes up with static network and schedule information for regional public transport and is linked to the EVA information system of German Rail. But at the present time, some improvements in this area still seem to be necessary. A strong focus should be given on real-time information and on the intermodal aspects (Park+Ride information etc.). EXPO service gates (Internet home page etc.) should be installed at different media to offer access to information on all transport modes. Mass media like TV and radio broadcasting (including TV-Text and RDS/TMC) should play a major role for the EXPO visitor information. Fax-polling and a telephone hotline (Mobility Service Center) could also provide intermodal information to a significant number of visitors. Individual information systems such as paging and PTA (personal travel assistent) could demonstrate their capabilities.

## **Choaches**

With 90.000 visitors using choaches and approximately 42 persons per choach (mean value) there will be approximately 2.000 choaches per day arriving at the EXPO. Wherever possible, measures have to be taken which can avoid choaches to be delayed by traffic jams or any other reason. This opens a wide field of opportunities for new technologies, mainly

- to give busses priority against other car drivers,
- to give bus drivers sufficient information on the actual traffic situation,
- to guide them on the best route to the EXPO and back to their origin,
- to allow a monitoring and control of busses heading for the EXPO, and
- to help passengers to find their bus on a parking lot or at a bus terminal.

It seems most important to have a bus prioritisation on critical links of the major network (mainly Autobahn). One measure could be to install priority lanes for busses (possibly on the emergency lane, but only if provisionally measures can ensure proper security), one other could be to provide separate, exclusive routes for busses in case of traffic jams. Prioritisation of busses on urban roads at traffic lights has been used in Hannover for regular public transport several years now. But choaches would need special, costly equipment to make use of the available infrastructure.

Experiences at the 1996 Olympic Games in Atlanta confirm that it is absolutely necessary to give sufficient information to all bus drivers on appropriate routes and on the road conditions during the EXPO. This will include not only printed material but also personal driver education in advance of the event. Basically, bus companies should not be allowed to use the facilities at the exhibition area without such driver education. Real-time information for bus drivers could be given through standard collective media, but also through individual information systems (e.g. paging, short message services).

Technologies for individual dynamic route guidance and for the monitoring and control of busses are also available (e.g. mobile telephone network GSM and Global Positioning System GPS). One major problem is to equip this large number of busses coming not only from Germany but also from neighbouring countries like Poland and the Czech Republic.

Passenger information is mostly needed at the bus terminals. These terminals will be necessary for regional and long distance bus services as well as for coaches which can not be parked directly at the exhibition area. Therefore, EXPO visitors may not be dropped at the same point where they can find their bus to travel home again. An information system (e.g. large info screens) is necessary that indicates the bus companies name, its destination and the gate number. This would allow a flexible occupation of bus gates and an intelligent operation of the terminals.

### **High Speed ICE and other Long-distance Trains**

From the beginning of the advance sale of EXPO tickets in 1998 it should be possible to make a reservation for trains. Since the regular reservation system of German Rail (DB AG) does not allow this long time of advance booking, it may be necessary to modify this system. Care has to be taken that regular trains have always enough capacity to handle the regular traffic which, of course, will not have that long reservation period; steady over-booking during the five EXPO months strictly has to be avoided, since it would lead to a durable loss of regular passengers.

Since special EXPO trains have a certain financial risk and are less flexible to use than regular trains, the regular schedule of German Rail will be extended by additional trains on the main routes to Hannover during the EXPO. For planning the schedule during the EXPO it will be most important to collect information on number and origin of visitors heading for the EXPO by train. Once again, this requires an intensive data exchange with the EXPO ticketing.

Several measures will be taken to ensure sufficient capacity for EXPO passengers. For example, this includes a re-routing of freight trains, and the consequent avoidance of any construction work on relevant routes during the EXPO.

For pre-trip passenger information the EVA system of German Rail could be used, which is available via different media (various online services, automated telephone answering machine etc.). Again, EXPO service gates should be installed at different media which offer access to information on all transport modes, including the EVA system.

One special case for on-trip passenger information could be to inform visitors already within the exhibition area about possible delays of their booked train (ICE and others).

This information seems to be very important since the EXPO station (Hannover-Laatzten) may be overcrowded if too many people are waiting there for their train. On the other hand, such information could avoid passengers to miss their train due to underestimation of the walking time from the exhibition to the station.

### **Air Traffic**

Of course, air traffic also plays an important role for a World Exhibition. Hannovers airport will improve its capacity until this event. This international airport will serve mainly for German and European flights, which even could be combined with an EXPO visit within a one-day trip. In principal, other flights could use other German airports (Hamburg, Düsseldorf, Frankfurt etc.) and even European airports (Amsterdam). For example, Frankfurts Rhein-Main Airport will have an own ICE station and allow a comfortable train ride to the EXPO within two hours.

### **Waterborne Traffic**

Although EXPO visitors can not reach the Exhibition by ship directly, some ferry links will be of major importance for visitors from Great Britain and Scandinavia. Sufficient capacity, proper scheduling and integration into the EXPO information systems seem to be necessary. In detail, it should be ensured that choaches do not need to stay overnight in a harbour because they missed a ferry due to traffic jams or to any other reason.

### **Car Traffic**

Traffic regulations for cars include a sophisticated traffic control system on the Fair Expressway (Messeschnellweg), which is the main route directly to the EXPO. As already proved for large fairs in Hannover, this expressway with normally two or three lanes per direction will be operated in a one-way mode during the EXPO, for example in the morning towards the EXPO.

A parking guidance system will be installed to allow additional visitors in the afternoon to make use of spaces which are no more occupied by early leaving visitors. All visitors should be informed on the parking area (North, South, etc.) when buying their parking ticket. They should also receive some information on best routes to reach the EXPO.

In residential areas around the EXPO and around attractive public transport stations all over the region it will be necessary to introduce a comprehensive parking management scheme. By an intensive public awareness campagne and through all available traffic information media visitors should be made aware that under no circumstances they could find a parking space anywhere around the exhibition area without having purchased a parking ticket in advance.

Park+Ride will play an important role, since parking space at the fairground is very limited. Even the regular EXPO Park+Ride facilities will require a reservation. Park+Ride could also help in case of traffic jams which certainly cannot be completely avoided over a period of five months. Variable message signs on major routes could help to inform drivers on the actual traffic conditions and on the availability of parking spaces.

The handling of spontaneous visitors still requires some planning work to be done. Basically, they should be guided to limited Park+Ride facilities in some distance from Hannover. As far as available, EXPO entrance and parking tickets for the actual day

could be sold at parking facilities along the highways (Autobahn) in the Hannover region, at major public transport stations, and at other adequate locations. Here, automated selling machines and info posts could be used.

Since some periods with very high traffic volumes on the highways around Hannover have to be expected (not only during the EXPO), some links will be equipped with advanced traffic control systems. Furtheron, the feasibility of some measures should be checked which are not common on German highways so far. For example, this includes temporary speed limits, priority lanes for busses and even ramp metering.

### **Internal Visitor Transport**

For the transport of visitors within the exhibition area several transport systems should be installed. But since the EXPO area is quite small, not every visitor must have the possibility to use such system during his stay on the EXPO. Besides a high capacity ring bus system around the exhibition some people movers as well as some special shuttle services for handicapped, VIP's, and others are planned. In addition, as many transport systems as possible should improve the attractivity of the exhibition and demonstrate advanced technology.

### **Intermodal Traffic Control**

The traffic control center to be installed in Hannover will also be used during the EXPO. Delegates of traffic system authorities and operators will work together in one room, equipped with adequate control interfaces to all relevant transport systems. To support the coordinated control of transport systems during the EXPO and to feed the various traffic information systems, it is necessary to establish a sufficient static and dynamic data base on all transport systems including ticketing data. Traffic management strategies and a library of measures should be pre-determined for any case of transport system breakdown or other disturbances during the EXPO. Therefore, simulation tools should be used, and sufficient training of the personal in the traffic control center and pretests for different scenarios seem to be necessary.

### **OUTLOOK**

Although this paper could not give a complete overview on all transport related aspects for the EXPO 2000 in Hannover it shows the complexity, the risks and the chances of this unique transport engineering task. Of course, advanced technologies alone cannot solve all transport problems when 40 mio. people visit one single location within 153 days. But an intelligent use of the limited capacity of transport systems urgently requires an intensive control, and this can be supported significantly by telematic systems and other advanced technologies. To find excellent solutions for all outlined problems is a challenge for the transport authorities and operators in Hannover, for German traffic engineers and for the German industry, all together hosting the world at the EXPO 2000 in Hannover.