**Project update**

**Getting through the certification process**

*By Jan Van Dijke, TNO, CityMobil Coordinator*

One of the barriers that are in the way of full scale implementation of automated transport systems is the absence of universally accepted certification procedures. The absence of such procedures means that it is difficult to convince stakeholders that a system is safe and if stakeholders are not convinced that a system is safe they will hesitate when implementation decisions need to be made.

In the automotive world the situation with respect to safety is very clear. A vehicle must meet a huge number of standards before it is allowed on our public roads. But if it meets these standards and has all the necessary certificates, nobody doubts whether it is safe enough anymore. Barring exceptional circumstances a manufacturer can put a vehicle on the market without having to fear law suits in case accidents happen with the vehicle.

For automated transport systems such standards do not exist as yet, which means that manufacturers have to find out what the requirements are in every individual case. This can lead to the strange situation that for the same system, with the same specifications, used in the same circumstances completely different demands are made at different locations. Sometimes the responsible authorities accept a safety case evaluation and sometimes they demand that a system must meet existing standards made for other systems that have one or more specifications in common with the observed system. For instance: since automated transport is (electronically) guided transport, sometimes compliance with the requirements for other mechanically guided systems, like trains and tramways is required.

In order to do a first step towards clarity about the safety requirements for automated transport systems TNO, together with its partners has developed a draft set of certification guidelines. This work started a number of years ago in the European 5th Framework project CyberCars and was continued in CityMobil. The present status is that a set of draft certification standards is available. These draft standards have proven their usefulness in a number of evaluations of automated transport systems and will now be used to assist in the certification of the CityMobil Rome demonstrator. The core of the draft standards is a system safety analysis. In this system safety analysis the focus is on possible failures of system functions. By analyzing what the severity of a system failure is, in terms of possible injuries to occupants, operators or members of the public and what the likelihood is that such a failure will occur a value for the risk of a certain failure can be established. By identifying all failure modes and establishing risk factors a safety score for the system can be derived. By comparing that safety score with a previously established threshold value, a decision can be made as to whether or not the system is safe enough.

In addition to the systems safety analysis a series of functional test needs to be carried out, to evaluate whether or not the system meets its functional specifications. Since automatic guided vehicles can have very different designs, the range of functional test must be established for each individual system. Tests of the braking system, the steering system, communication and communications systems will always be part of the set of functional tests.

We hope that this first step in the development of a certification standard will lead to a future in which it is clear to all stakeholders what the safety requirements for automated systems are so that one more barrier to the large scale implementation of automated transport systems will have been removed.

**The CityMobil City Application Manual**

*By Tom Voge, Transport & Mobility Leuven*

Decisions on transport strategy are always difficult. Deciding whether to invest in a wholly new technology is particularly challenging. On the one hand a new transport system can reflect favourably on the image of a city, as has happened with cities which have invested in new trams and driver-less metros. But on the other hand such systems bring with them additional uncertainties. Users do not know how they will perform, and what to expect, and may be reluctant at first to use them. The technology may not be completely reliable in the initial operation, or may give rise to perceived or real safety risks. The CityMobil City Application Manual has been designed in order to help planners, cities and local authorities, address these uncertainties. It provides a series of tools and suggestions for each of the stages of policy development.
Models and Tools
A number of tools for cities and operators are being developed to analyse transport requirements and potential impacts. These include a series of context scenarios over the period to 2050, a set of passenger and freight application scenarios which indicate the contexts within which different technologies are most likely to be effective, a tool for predicting patronage for new technologies, a business model for assessing the financial viability of technology projects, a sketch planning model for assessing the overall impact of these technologies in cities, and guidance on how to overcome the key barriers to implementation. This City Application Manual is designed to help cities make good use of these, and to provide general guidance on the approach which cities might adopt to deciding whether to consider new technologies and, if so, how best to apply them.

Sites and Examples
In particular a sketch planning model has been used to provide illustrations of the potential contribution of each technology for four cities: Gateshead (UK), Madrid (ES), Trondheim (NO) and Vienna (AT).
Information presented in the City Application Manual addresses the following key issues:
• understanding future scenarios,
• identifying the most appropriate applications,
• considering wider range of policies within which the new technology might fit,
• appreciating the barriers and ways in which they might be overcome,
• predicting performance and patronage,
• assessing the business case,
• conducting a wider appraisal of the options.

La Rochelle to run cybercar demonstration
Following the successful CityMobil showcase of September 2008, Maxime Bono, the mayor of the city of La Rochelle has decided to test a transportation service with cybercars. The cybercars will operate on-demand in the new section of the city centre between the harbour (and more precisely the arrival station of the electric boat which goes to the city centre) and the entrance of the university (a large plaza with the Technoforum, a bus station, numerous restaurants and a large multiplex cinema). The cybercars will run on a large pedestrian street (Avenue des Amériques) of about 800 metres and should serve the houses along this road, the TechnoForum, the Passeur (electric boat shuttle) and the mediatheque (multi-media library). The route will cross two existing roads with normal traffic (traffic lights will probably be installed). Extension of the service into the university campus using the dedicated bus routes at night (when the buses are not running) will also be considered.

Cybercar demos in Vantaa & Trondheim
The cities of Vantaa (Finland) and Trondheim (Norway) will host the next CityMobil cybercar showcases. These 2-week demonstrations will show to the local audience how these systems can improve the public transportation service by complementing mass transportation in the “last mile”. The city of Vantaa, in the outskirts of Finland’s capital and location of Helsinki’s airport, will study the implementation of such systems in a new area called “Marja-Vantaa”. Vantaa’s showcase will run from 7 until 17 May 2009. The city will also host a conference for transport specialists on automated transport applications in urban environments on 8 May 2009 and for local citizens on 9 May 2009 (More information at: http://www.techvilla.fi/index.php?article_id=1234). Trondheim, ancient capital of Norway, will study the application of automated transport systems as a feeder for the St. Olaf Hospital area. The city will also organise a conference on future solutions for a sustainable transport sector in the future on 26-27 August 2009.

News from the demonstrators

Group rapid transit at Rome exhibition centre
The preparation of the demonstration of the people mover system (based on Cybercar technology) in the main car park of the new Rome exhibition centre is proceeding well. The Cybercar corridor has a round-trip length of about 1 620 metres and includes 11 stops, which are within 100 metres of nearly all parking bays. The track will be fully segregated by means of a fence and the stops are provided with doors that open only when the Cybercars are stationary at the stop. Two of the stops are located close to the eastern and northern entrances of the new Rome Exhibition.
The main activities of preparing the Rome demo are currently concentrated in 3 areas. The first is the construction of the two Cybercar vehicles at Robosoft – the first Cyber is ready and the second vehicle is close to completion.

www.citymobil-project.eu/
The second area of work concerns the civil works - the P1 car park of the new exhibition centre has to be adapted to the Cybercar system and to meet the requirements of the Italian Ministry of Transport which is responsible for the certification of the system. The most important modifications to the P1 car park concern:

- The track which should be segregated - for this reason a 1.2 m high fence will be erected along the track and each stop will be provided with doors.
- The construction of a control room, a depot and maintenance area for the Cybercars;
- The installation of a fibre optic LAN needed to allow communication between the Cybercars and the control room.

The civil works plan was officially delivered by ATAC (a body of the municipality of Rome) on 28 March 2009 and the administrative procedure for issuing the call for tender for the works is ongoing.

The third area of work concerns the certification of the system. The Rome demonstration partners have held several meetings with the Ministry of Transport to discuss the project. Once the final design of the Cybercar system is provided (it is currently being finalised), the Ministry of Transport will set up a special commission that will analyse and test the system providing feedback, possibly suggestions and further modifications. This process will result in the certification of the system.

On Track at Heathrow

Installation of the first publicly-operating Personal Rapid Transit (PRT) system in the world is now in its final stage, and the system will begin operating with multiple vehicles at the end of April. Operational Readiness Testing through summer and autumn will ensure that all teething problems have been solved, and reliability checked, ahead of a public opening before the end of this year. Passengers at Terminal 5, and those passing on the Perimeter Road, are curious about the gracefully swooping guideways on which the battery-electric, four-seater vehicles will run, but all will be revealed when testing starts and vehicles are seen running around the network.

Construction has proceeded rapidly, and with very few difficulties, in this past year, and is currently concentrated on finishing the detailing of the stations, the vehicle depot, and the control room which is located alongside the depot. A short-notice requirement to double the communications frequency from 2.4 to 5GHz, to avoid any possible conflict with the baggage handling system at Terminal 5, caused a substantial redesign of some aspects of the control system, but the change was made remarkably smoothly. Business car park station 1 and the system depot are shown in the photograph (on the next page) with the special yellow test vehicle, which maps and tests the guideway, just visible under the station canopy. Several of the 16 final production vehicles have already been run on the guideway, and the remainder will be delivered in the next two months and fully tested at ATS’s Cardiff Test Track before being transferred to Heathrow. The photograph below shows a vehicle in station 2 of the car park. The vehicles ride smoothly and quietly, and with no tailpipe emissions, and are suitable for routing right into the airport buildings. For this pilot system, however, the Terminal station is contained within a multi-storey short-term car park alongside the impressive Terminal 5 building. This station contains four vehicle berths, with the vehicles entering the diagonal berths running forward, and reversing out.
last two weeks of March, and the PRT system will be surveyed in exactly the same way in March 2010. We are all familiar with buses, and we can expect few surprises from this first survey, but PRT will be entirely new, and passengers’ attitudes to it will be of great interest to BAA as well as to CityMobil.

News from other projects

PRT system taking shape in Masdar

A personal rapid transit (PRT) system has been selected to move people around the futuristic, eco-friendly city of Masdar which is currently being constructed to the south east of the city of Abu Dhabi (United Arab Emirates) besides the international airport. Masdar will rely on solar energy and other renewable energy sources and will have a policy of zero-carbon and zero-waste. When completed in 2014 or so, the city will ultimately be home to a population of 40 000 residents with an additional 50 000 additional commuters. Cars will not be allowed within the confines of the city and the main travel modes will therefore be of the soft kind (walking, cycling or Segways), light rail or PRT.

Ultimately some 2000 to 3000 vehicles could be used to move people and goods between around 100 PRT stops. In the first instance, 13 vehicles will be delivered in the second half of 2009 to be tested at the Masdar Institute for Science & Technology, which starts classes in August 2009. The 10 passenger cars will cater to around 100 students and 20 staff and will have two stops approximately 150 metres apart. The vehicles will have a driver time of 3 hours and batteries will require one hour charging. The navigation system is based on ‘odometry’ which counts the number of wheel revolutions and notes the wheel angle to calculate its position. Road magnets will also play a role. The vehicles will travel at 40kph along straight sections and 25kph when turning.

Partner profiles

28 organisations representing industry, research and public authorities, are partners in CityMobil. Each issue of the CityMobil newsletter profiles three partners.

Transport & Mobility Leuven NV is a joint venture between the Belgian university K.U.Leuven and the Dutch research institute TNO. Transport & Mobility Leuven clusters the knowledge of both research institutes and applies it to actual policy problems. Its research field is applied scientific research: transport and environmental economics, traffic and transport, logistics and freight transport. Its core business is the analysis and explanation of transport and mobility, making use of forecast models, simulation techniques and quantitative research. It also develops its own models, eg the Tremove emission model.

TRW Conekt is the consultancy arm of TRW Automotive (automotive safety systems supplier) and brings together key services in engineering, knowledge and technology specialising in advanced product development, international research programmes and application engineering of mass produced systems to low volume and niche vehicles. Product reliability and validation services including environmental, vibration, EMC and HALT testing are also offered.

ISIS (Institute of Studies for the Integration of Systems) is an Italian private research and consulting firm, active since 1971 at the national and international levels in the areas of information and decision support systems, mathematical modelling and operational research. ISIS has a direct experience in many 4th, 5th and 6th EC Framework Programmes projects. ISIS has also long standing experience of research and building of systems of indicators and Decision Support Systems for local authorities and networks of utilities in Italy.

Related events

- CityMobil – Future Mobility Solutions Conference, Vaantaa (FIN), 8 May 2009
  www.techvilla.fi/index.php?article_id=1234
- INCOM ’09, Special session on planning & control of AGVs, Moscow, 3-5 June 2009,
  http://incom09.org/doc/cfp_session09.pdf
- ITS World Congress, Stockholm
- 3rd Transport Research Arena (TRA2010), Brussels
  7-10 June 2010, www.traconference.eu