Towards advanced transport for the urban environment

Second 6 month progress reports concerning the demonstrations

<table>
<thead>
<tr>
<th>Deliverable no.</th>
<th>D.1.1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissemination level</td>
<td>Public</td>
</tr>
<tr>
<td>Work Package</td>
<td>WP 1.1: Coordination</td>
</tr>
<tr>
<td>Author(s)</td>
<td>A. Zlocki</td>
</tr>
<tr>
<td>Co-author(s)</td>
<td>P. Bly, H. Muir, G. Giustiniani, M. S. Matoses, M Parent, R. Librino</td>
</tr>
<tr>
<td>Status (F: final, D: draft)</td>
<td>F_23.04.07</td>
</tr>
<tr>
<td>File Name</td>
<td>D.1.1.1-Public-2nd 6month progress report-FINAL Draft v2.1-Zlocki 230407.doc</td>
</tr>
<tr>
<td>Project Start Date and Duration</td>
<td>01 May 2006 - 30 April 2011</td>
</tr>
</tbody>
</table>
TABLE OF CONTENTS

1 Executive Summary 3
2 Introduction 4
3 Progress of the large scale demonstrations 4
   3.1 Heathrow 4
      3.1.1 Current status of work 6
      3.1.2 Comparison with time schedule 7
      3.1.3 Adaptations of work and time plan 7
      3.1.4 Next steps 7
   3.2 Rome 8
      3.2.1 Current status of work 9
      3.2.2 Comparison with time schedule 9
      3.2.3 Adaptations of work and time plan 10
      3.2.4 Next steps 11
   3.3 Castellón 11
      3.3.1 Current status of work 11
      3.3.2 Comparison with time schedule 11
      3.3.3 Adaptations of work and time plan 12
      3.3.4 Next steps 12
4 Progress on showcases and city studies 13
   4.1 Current status of work 13
   4.2 Comparison of the current status with the time schedule 15
   4.3 Adaptations of work and time plan, if necessary 15
   4.4 Next steps 15

FIGURES
Figure 3-1: Plan of route at Heathrow (left) and aerial view showing proposed route (right) 5
Figure 3-2: Proposed station layout (left) and proposed vehicle interior (right) 5
Figure 3-3: Test vehicle exterior (left) and test vehicle chassis (right) 6
Figure 3-4: The area where the new exhibition is being built 8
Figure 3-5: New car-park structure after the insertion of the CTS 9
Figure 3-6: New Work Plan for Rome Demonstration 10
Figure 4-1 Two CyCabs provided by ROBOSOFT and a CityCab provided by Yamaha 13
1 Executive Summary

In the future cities will need integrated traffic solutions, which provide a more effective organisation of urban transport and require mobility in an efficient, safe and economic way. The goal of the CityMobil project is to contribute to these solutions.

In the first sub-project of CityMobil concepts and tools, which are developed in the project, will be validated and demonstrated in a number of different European cities. Therefore three large-scale demonstrators have been chosen, which will present real implementations of innovative transport concepts. The demonstrators are located at the airport of Heathrow, at the new exhibition building in Rome and at the city of Castellón.

This deliverable describes the three large-scale demonstrators and the current status of work in the reporting period between 1st of August 2006 and 31st of January 2006. The progress of work is given and the schedule is compared to the progress. Deviations to the work plan and necessary adaptation of the time plan are stated. In the end of each section the next steps for each of the three demonstration sites are presented.

The progress of the work on the showcases and city vehicles is given. Deviations to the work plan and necessary adaptation of the time plan are provided. The next steps for both vehicle types are presented at the end.
2 Introduction

The objective of the CityMobil project is to contribute to a more effective organisation of urban transport, resulting in a more rational use of motorised traffic with less congestion and pollution, safer driving, a higher quality of living and an enhanced integration with spatial development. In order to achieve these objectives advanced concepts for advanced road vehicles and passengers are developed. Furthermore new tools for managing the urban transport are introduced and barriers that are in the way of large-scale introduction of automated systems are removed.

In the first sub-project of CityMobil (SP1) those advanced concepts and tools are validated and demonstrated in a number of different European cities under different circumstances. Therefore three large-scale demonstrators have been chosen, which will present real implementations of innovative new concepts. Theses three innovative concepts will be implemented in the city of Heathrow, Rome and Castellón. The three cities were selected in the preparation phase of the project based on the assessment of technical feasibility, political support in form of Letters of Intent, a commitment to invest financially in the project and an availability of a local consortium consisting of public and private organisations, which had expressed commitment to the plans.

The demonstration activities are the core element of the CityMobil sub-project 1. Therefore the status and the progress of the demonstrators are monitored and reported on a regular 6-month basis.

In this deliverable the progress of the 6 months period from the 1st of August 2006 to the 31st of January 2006 concerning the demonstrations and the showcases is described. The description of each single demonstrator is given in the progress report dealing with the first 3 months of the project from May 2006 to July 2006. The current status of the work and a comparison of the current status with the schedule is the main focus of this report. Necessary adaptations to the time plan as well as the next steps for each of the three demonstration sites are presented in the end of each section. The progress of the second 6 months concerning the work on the showcases and city vehicles is given. Deviations to the work plan and necessary adaptation of the time plan are provided. The next steps for both vehicle types are presented at the end.

3 Progress of the large scale demonstrations

3.1 Heathrow

The Heathrow demonstration involves the implementation of a PRT (Personal Rapid Transit) system at Heathrow Airport. An important focal point of the CityMobil project is to evaluate the effectiveness of the ULTra (Urban Light Transport) PRT system in this application.

ULTra is based on small, light and energy-efficient battery-operated vehicles that run on a segregated guideway network offering a personal automated taxi service with point-to-point, non-stop travel and no waiting. The system offers the convenience of a car, combined with the capacity of light rail but at a significantly lower capital cost.
The system will link a passenger car park (1400 spaces) to the newly constructed Terminal 5. Figure 1 illustrates the final route of the 3.9km pilot system, which is to be examined in the CityMobil project. Figure 3-1 gives an aerial view of the site.

Figure 3-1: Plan of route at Heathrow (left) and aerial view showing proposed route (right)

The vehicles at Heathrow will accommodate 4 passengers plus any luggage. A total of 18 vehicles are to be used along the pilot route, carrying an estimated 300,000 passengers per annum. It is anticipated that the use of the PRT system by airport passengers will be included within the cost of car parking. Figure 3-2 illustrates the proposed station layout and the proposed vehicle interior.

Figure 3-2: Proposed station layout (left) and proposed vehicle interior (right)
The work of the Heathrow demonstration will contribute to each of the specific evaluations planned for the CityMobil project:

- To quantify and qualify the benefits of advanced road transport systems
- To monitor the progress of the demonstrations and provide feedback
- To generalise the evaluation results of trials and studies and transfer them to other cases
- To identify how advanced road transport systems can contribute to sustainability

3.1.1 Current status of work

The current status of the Heathrow demonstration, in month 9 of the project is as follows:

- The first vehicle shell (Figure 3-3 left) and fully operational test chassis (Figure 3-3 right) were delivered to the Cardiff trial site in December 2007. Testing of the chassis commenced shortly after their delivery, and is expected to be completed by May 2007.

Figure 3-3: Test vehicle exterior (left) and test vehicle chassis (right)

- The manufacture of the first Heathrow prototype vehicle, as a forerunner of the actual service vehicles, is under construction and will be delivered in April-May 2007. All 18 vehicles will be delivered by the end of 2007. Each vehicle will be thoroughly tested on the Cardiff test track following delivery to ensure reliability.
- The detailed design of the route and guideway layout at Heathrow has now been completed and agreed with BAA (British Airports Authority), the airport owners. This is M1.2.2.1 in WP 1.2.2, which has been completed in line with the M9 deadline.
- The construction of the system at Heathrow is underway, with the first foundations being installed in January 2007. The entire guideway infrastructure, including stations, will be completed before the end of the year. Communications and control equipment will be installed on the track, and the central control room will be fitted out, in the first three months of 2008. Commissioning of the full system will take place through the summer, working towards full passenger operations in the autumn of 2008.
- Production is well underway of a simulation package to enable the potential benefits of a PRT system to be assessed for any city. This is D1.2.3.2 in WP1.2.3, which is due to be delivered in M24, although in practice this will be available well before that date. The package will simulate the detailed movement of the PRT vehicles around a network designed by the user, serving a demand matrix, which can either be specified by the user, or generated by the package from user descriptions of the overall level of activity at each station. Tools will be provided to help the user design a practical network,
though necessarily aspects of the operation and control of the system will be simplified and limited in scope compared with the full ATS simulation package, which is used to design and develop real PRT networks. The simulation will generate a number of standard output performance indicators.

3.1.2 Comparison with time schedule

The construction of the infrastructure at Heathrow was due to begin in October 2006, however due to external circumstances this did not begin until January 2007. This setback is not expected to delay the date when the service will become open to the public, in September 2008.

The remainder of this section lists the progress in conjunction with the schedule for deliverables and milestones for all relevant WPs that are either underway or for which work will be done in the first 18 months of the project.

Within WP1.2.1, there is one deliverable, D1.2.1.1: Yearly reports on the demonstration progress, due to be delivered in M12. As this will largely build on this and previous progress reports it is not anticipated that there will a problem meeting this deadline.

Within WP 1.2.2, there is one milestone to be completed by M9, M1.2.2.1: the completion of the detail design. As mentioned in the previous section this has now been completed thus meeting this milestone. The second milestone within this WP is for the initial production vehicles to become available (M1.2.2.2) by M18. Vehicle production is on target. The only deliverable within this WP, D1.2.2.1: Summary specification for the Heathrow pilot scheme is due by M12. It is anticipated that this will be completed on time with a draft circulated for review in mid-March.

Within WP 1.2.3, there is one deliverable (D1.2.3.1: Identification of the key parameters affecting the passenger and operator satisfaction with the transport system and key benefits anticipated) and one milestone (M1.2.3.1: Definition of key parameters and benefits) due in M12. At this stage it is expected that these will both be completed by the deadline with a draft of D1.2.3.1 circulated in mid-March, though it should be appreciated that both documents are to be drafted at a relatively early stage in development at Heathrow, and that some details are likely to change as the development proceeds.

3.1.3 Adaptations of work and time plan

It is not anticipated at this stage that any adaptations will be required to either the work to be carried out or the time plan of the Heathrow demonstration.

3.1.4 Next steps

The time schedule for work over the next six months (up to M15) is as follows:

- The continuation of ongoing work including infrastructure construction at Heathrow, trials on the engineering test vehicles at Cardiff and production of the simulation package
- The annual report on the progress of the Heathrow demonstration will be completed by M12
- The first Heathrow prototype vehicle will be delivered in April 2007
• Work will begin on D1.2.3.1 and M1.2.3.1 to ensure completion by M12.

3.2 Rome

Rome is one of the three major CityMobil demonstrations and it contributes to the Project objectives of demonstrating the feasibility, public acceptance and performances of innovative automated transport systems.

Rome demonstration is a short distance transport service using small automated vehicles, so called “cybercars”, to collect people from their parking slot or from the train station and to bring them to the entrance of the new Rome exhibition building. With respect to previous cybercars applications this new installation has a number of technical and integration features, which will contribute to supply a service of extremely high quality that is therefore expected to have a good impact on the public.

The system will provide a fully on-demand service, and vehicle reservation will be integrated with the car-park management; each time a car enters the car-park-gate it receives the number of the slot where to park and an automated vehicle is called to wait for the car occupants at the right stop.

These features contribute to the achievement of four different objectives:

• Improvements in transport performance.
• Increased public acceptance of public transport services.
• Proof of financial viability.
• Demonstration of the technical maturity of the technology.

Figure 3-4: The area where the new exhibition is being built

The Rome demonstration will be implemented in the main car park of the New Rome Exhibition. The New Rome Exhibition is located in the direction of Fiumicino airport (the main international airport of the city) on the west side of the city 3 km outside of the outer ring road and 16 km away from the city centre, along the airport highway and railway link.

The area where the new exhibition is being built is on the lower side of the airport highway and railway link and it is shown on the left in Figure 3-4, whereas the new building for the Rome exhibition centre is shown on the right in Figure 3-4. Around a 1.5 km long central corridor, each block represents an exhibition stand of 72 by 12 metres each.
To dimension the operating cybercar network, the car-park size and the demand have been estimated on the basis of data from other European exhibition centres of similar size to Rome’s. 8 vehicles with space to carry 20 passengers are reckoned to be sufficient to serve the demand of the car-park zones further than 200 m from the entrance.

The new structure of the car-park after the implementation of CTS is shown in Figure 3-5.

The main features of the new system car-park – cybercar network are:

- A “car corridor” around the car-park to allow car owners to reach the slots, which they have been addressed at the car-park entrance gate;
- A central “cybercar corridor” from the left to the right with five vertical joined corridors to serve all the car-park;
- Car-slots for impaired mobility people cars near the entrance of the building.

**Figure 3-5: New car-park structure after the insertion of the CTS**

3.2.1 Current status of work

The New Rome Exhibition has been opened on 21st of September of 2006. The main car-park is now managed manually and many problems have been experienced by customers going to the exhibition and by Exhibitors. The P1 car park is always empty, because of high entrance Fee that is 5 € and there is a problem due to illegal parking in the surrounding of Rome Exhibition. For this reason the Commissioner for the Mobility of Rome Municipality is trying to find out a solution.

Municipality of Rome is going to assign to ATAC the management of the main car park (P1 car park) because ATAC is an Institutional Partners of the Rome Municipality. The call for tender has been prepared in Italian language.

3.2.2 Comparison with time schedule

For what concern the time schedule there is a delay and the detailed design, Deliverables 1.3.2.2 should be ready at month 9, January 2007, and is not ready. The call for Tender for
the management and the implementation of the CTS in the P1 car park has not yet been published.

3.2.3 Adaptations of work and time plan

The Municipality of Rome, to solve all the problems reported, has agreed with ITR a new plan of works. This plan of works has been proposed also to ATAC that is going to enter in project as partner.

The plan of works is reported in Figure 3-6 and below explained:

1. Awarding to ATAC of the management of New Rome Exhibition park-areas and Call for tender for the supply of the management system of P1 car-park and award to the best bid (March 2007 - May 2007);
2. Call for tender for the supply of cybercars and the realisation of guidance and control system for CTS in the P1 car-park and award to the best bid. ATAC will buy two cybercars with an option for buying other 8 cybercars at the same conditions proposed by the contractor in the bid within 15 months from the sign of the contract. (April 2007 - June 2007);
3. Infrastructural works in P1 car-park for the insertion of CTS (May 2007 - July 2007);
4. Delivery of two cybercars, installation and test by the Minister of Transport (October 2007 - November 2007);
5. Delivery of other 4 cybercars, opening of CTS, and evaluation of CTS extension to the Train Station and to other car park areas (April 2008 - October 2008);
6. Acquiring of other 4 cybercars for linking the train station to the main entrance (October 2008);
7. Call for tender for the infrastructural works for the extension of the CTS (October 2008);

Figure 3-6: New Work Plan for Rome Demonstration
3.2.4 Next steps
The next steps for the Rome Demonstration will be the entering of ATAC in the project and then the publication of the call for tender as reported above.
Both of these steps could encounter more problems than planned. The involvement of ATAC in the project could require more time than planned because of political and procedural problems.
In order to avoid problems during the homologation test phase, technical requirements and the project reported in the call for tender will be informally submitted to the Ministry of Transport and all suggestions will be inserted in the call for tender.

3.3 Castellón
The Castellón demonstrators will implement a bus/tramway system providing a lower cost alternative to light rail while having the advantages of dedicated rights of way.

The Castellón demonstrator will provide considerable flexibility in operations. A suitably adapted bus/tramway could travel on a guideway where this is available but could also travel on any other part of the road network as required, something especially useful in the city centre.

In this context, the Castellón demonstration will make use of electrical traction vehicles with guidance systems to circulate over a reserved platform. The vehicles will be powered through a tramway catenary, having in addition another secondary power supply system –possibly battery based- to be used in the historical centre of the city, where it is not possible to have an aerial power system.

3.3.1 Current status of work
The second internal meeting with the GVA, ENQ and ETRA is planned for the second week of January in order to analyse the requirements of the IT systems to be implemented for the site and prepare the GA to be hosted in Valencia in April ’07.

Currently the kind of vehicles, which will be used for the site, has been selected. The tender for the choice of the vehicles was closed with five final bidders. The offers have been rated and the internal technical reports analysing the different possibilities have been already delivered.

The design of the platform will be finished in January 2007. The delivery of the platform is planned for the summer 2007. Call for tenders for the second phase has also concluded.
The FCVARE presented at the Committee of Regions in Brussels the Castellón Demonstrator, starting in this way the awareness actions. Furthermore, the demonstrator was also presented at the Europe INNOVA event in Valencia (Spain, 26th to 28th November).

A part of the system (non-automated) should work in the second half of next year.

3.3.2 Comparison with time schedule
No major deviations from time schedule and working plan can be seen at current time.
The first milestone was due at M6 (M1.4.4.1 Preliminary engineering plans), though the deliverable associated should be ready at M9 (D1.4.4.1 Design of dedicated lane infrastructure, M1.4.4.2 Analysis of the noise emissions and landscape).

One of the objectives of the second internal meeting with GVA is the retrieving of information to produce D1.4.4.1. In order to guarantee the quality of the document (review process), the document will be delivered in M12.

There are no deliverables or further milestones due from the Castellón demonstration until month 12 of the CityMobil project. At this stage all work is running according to the planned schedule. The delay in the evaluation of vehicles is not affecting the planned schedule.

### 3.3.3 Adaptations of work and time plan
D1.4.4.1 will be delivered in M12, instead of M9.

### 3.3.4 Next steps
The time schedule for work over the next six months includes the follow up of the work developed within WP1.4.2 (vehicles), WP1.4.3 (IT systems) and WP1.4.4 (Infrastructure).

The design of the platform will be finished in January 2007. The delivery of the platform is planned for the summer 2007.

Hopefully, for the next GA a vehicle will be available in the Castellón demonstrator. The test trials are planned for summer 2007, and the service should start working in September.
4  Progress on showcases and city studies

The objective of showcases and city studies is to raise the awareness of European cities about new forms of urban transportation based on cybercars and advanced city vehicles.

4.1  Current status of work

Cybercars

Three cybercars, property of INRIA have been selected for showcases as "best available vehicles" (see Figure 4-1):

Figure 4-1 Two CyCabs manufactured by ROBOSOFT and a CityCab manufactured by Yamaha

These three vehicles are small enough to be transported simultaneously to a chosen location. There are two more vehicles available (one CyCab, one CityCab) for showcases as a back up. All of these vehicles are in good shape and can represent very well the capabilities of small-scale cybercars (from 2 to 5 passengers).

Various scenarios have been looked into, which could be demonstrated with these vehicles. A generic one has been selected, which can be easily deployed in various locations. A simple network in the shape of the figure 8 (which can be reduced to a figure 0) with one-way paths has been selected as the scenario.

On this network it is possible to position a number of "stations" (between 2 and 4). Up to three cybercars will be operated simultaneously. A vehicle can be called from any location using a PDA with Wi-Fi connection to the dispatcher, which selects the best available vehicle. The destination can be selected from a panel inside the vehicle.

In addition to the selection of the scenario, INRIA has defined a number of manoeuvres necessary to execute it. Following is a description of the manoeuvres, from the less complex to the most complex, that the cybercars execute during the showcases:

1.  Move alone along a given route (made of waypoints).
2.  Detecting and following the road.

Obstacles detection and avoidance

3.  Detect and avoid static and moving obstacles.
Collaborative vehicle-to-vehicle or vehicle-to-infrastructure interaction

4. **Avoid another Cybercar through trajectory and sensor data exchange.**
5. **Correctly handle a crossroad situation under supervision.**

Various technologies, which will be implemented in the vehicles to have the showcases ready by month 18, have been investigated. The following are the basic technologies, which have been retained:

- **Navigation:** combination of street border following (variable gap), low precision GPS combined with odometry and landmark localisation (with laser scanner)
- **Obstacle avoidance:** combination of laser scanner and stereo vision
- **Management:** simple software on a PC with had-hoc network (OLSR) for communication with the vehicles and PDAs

INRIA is currently integrating the technologies required for the cybercars to execute the scenarios. INRIA has also contributed in the site selection process.

To help accomplish the objective of raising the awareness of European cities about new forms of urban transportation based on cybercars and advanced city vehicles through the Showcases, INRIA is developing, in parallel to the technologies of the vehicles, a demonstration protocol. This will help gather INRIA's experience on the organization of cybercars' demonstrations and showcases.

The demonstration protocol will serve as a deployment manual for the showcases, in order to guarantee the accomplishment of the showcases’ objectives and to adapt the selected scenario to the specific city site where the showcase will be presented. It will also guarantee that the public acquires a minimum knowledge of the Cybernetic Transportation Systems through a communication strategy directed to citizens, transport operators, politicians and stakeholders. Finally, the demonstration protocol should serve as a basis to preview the showcases’ budget.

**City vehicles**

Starting from the decision to use Panda model to implement dual mode vehicles, the car propulsion system has been considered, in order to fulfil the requirements of automatic driving at low speed and to provide ecological features. An attempt to use a CNG version was made, but this type of vehicle was not available at that time. Furthermore, it was evaluated the possibility to convert an ICE car to an electric one, but the cost effort and the long development time have advised against this solution.

So a car with robotized transmission was chosen and a car was bought. Some preliminary activities on control system were performed, to evaluate the required modifications of braking system and of steering system, so that a supervisor would control these systems.

Therefore the supplier of the ESP unit has been involved. This supplier made some development work to modify the software and provided a prototype unit able to realize braking via CAN signals. Some tests were performed in different times to check the functionality of the braking systems. At the end satisfactory results were achieved.

In parallel a similar activity was performed regarding EPS for automatic steering. Unfortunately, the unit used as normal-production part is not suitable to be modified for external control. Therefore other solutions have been investigated, involving two suppliers. Mechanical problems and software aspects were examined and a suitable solution has been identified. This solution is an unit developed for a different car model, and has to be software adapted.
Finally Panda cars with electric propulsion have been considered again, thanks to the fact that in the meantime a producer (MesDea) has developed an electric Panda, to put the vehicle into the market. Contacts have been made to evaluate the integration of electric propulsion developed by MesDea with the control system based on ESP and EPS.

4.2 Comparison of the current status with the time schedule
No deviations from time schedule and working plan can be seen at current time for cybercars. The work is currently proceeding as planned.

For the city vehicle the need to realize new dual mode cars based on models different from those considered as the available ones before the start of the project, has required more analyses than foreseen, with less man-month efforts but longer time to explore alternatives and to contact suppliers and to receive from them answers and prototypes. Notwithstanding these delays, CRF has the objective to realize the cars in due time for showcases.

4.3 Adaptations of work and time plan, if necessary
At current time adaptations to the time plan are not necessary for cybercars.

As CRF dual mode cars are concerned, some adaptation of the work-plan could be necessary, but information to take decisions will be available after this reporting period. In fact, the delivery time of the adapted components for control system will be known at the end of the definition phase with suppliers for each component.

4.4 Next steps
The basic technologies for cybercars, which were investigated, are being implemented into the vehicles and will be available for demonstrations according to schedule. The demonstration protocol is being developed and will be available for demonstrations according to schedule.

The next steps for city vehicles will be the decision to build Panda electric cars, the selection of the sensors for collision avoidance and the definition of an image processing system. These systems will be different from those used in the past, because new better versions are available and a different method for lane detection will be considered.