PubTrans4All

Public Transportation - Accessibility for All

Deliverable 5.3

Newsletter 3:
Project Results Summary

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1. Introduction

The PubTrans4All project's main objective is to develop a prototype of a vehicle-based boarding assistance system (BAS) that can be installed into new rail vehicles but also retrofitted into existing rail vehicles and can be used on many different types of rolling stock and infrastructures.

Accessibility of rail vehicles for people with reduced mobility (PRM) is particularly problematic since rail vehicles have a long service life (40 years or longer) which means that many currently inaccessible vehicles in the meaning of TSI PRM will remain in service well into the future.

As a part of developing a new prototype of a BAS, the consortium surveyed at the beginning of the project state of the art accessibility devices and made recommendations for best practices of use and operation of these devices. Furthermore an international student contest was held in spring 2010 finding new ideas and innovative solutions for a new BAS. Any new idea improving the interface between platform and vehicle was accepted. In total 38 students from Austria, Hungary, Serbia, Croatia and Bulgaria participated at the contest and submitted their ideas.

As currently no vehicle-based BAS exists for classical UIC-wagons, the consortium decided to develop a BAS for this type of wagon considering that UIC-wagons build the worst case for infrastructure and car body dimension. Installation investigations and technical calculations led to the adoption of the swivel lift concept as the best suitable design concept for the restricted space conditions in classical UIC-wagons. After finalizing the building phase, the prototype was first factory tested at the site of our consortium partner and lift manufacturer MBB Palfinger. Therefore a test bench (welded steel construction) was built displaying all technical restrictions of a classical UIC-wagon for testing purposes. Next, the prototype of a BAS has been sent to our project partner BDZ in Bulgaria and is in course of installation into a UIC-wagon of the Bulgarian State Railways. During the summer months, the prototype will be tested on the railway network in Bulgaria. In September, the new BAS prototype installed into a UIC-wagon of BDZ will be presented to the interested public at the InnoTrans 2012 in Berlin.

This newsletter gives a brief overview of the results of the development of the new BAS prototype for classical UIC-wagons. For more detailed information see Deliverable 4.1 - Vehicle-Based BAS Conceptual Design Recommendations, Deliverable 4.2 - Vehicle-Based BAS Preliminary Design Recommendations, Deliverable 4.3 - Prototype BAS Development Report and Deliverable 4.4 Vehicle-Based BAS prototype design and evaluation. The

Deliverables available for public consultation can be found on our project homepage www.pubtrans4all.eu .

2. Preliminary design process of the new BAS Prototype

This newsletter gives a short description of the chosen conceptual designs for a new BAS and explains how the decision process of the Prototype Development Group (PDG) and the whole consortium of PubTrans4All was made in favor of the swivel lift concept.

2.1 Parallel Ramp

The first conceptual design proposal chosen by the consortium for a more detailed feasibility study is based on a ramp concept. This design concept of a parallel ramp shown in picture 1 was submitted by a student who participated at the PubTrans4All student competition held in spring 2010.

Picture 1 – Parallel ramp

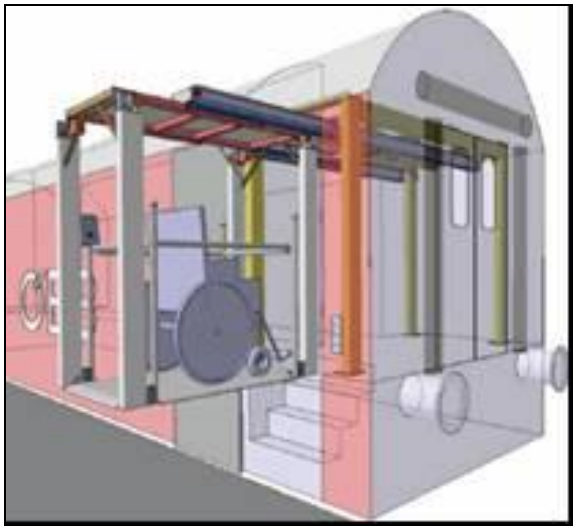
Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 11

Unfortunately, more detailed technical analysis showed that a ramp solution is not applicable for a height difference of more than 400 mm (between platform and wagon floor) which is the case for classical UIC-coaches and all other high floor trains. Therefore the parallel ramp was not taken into further consideration for the new BAS design concept.

2.2 Elevator lift

The second design concept chosen by the consortium for a more detailed feasibility study is also based on the innovative idea from a student of the TU Vienna (Vienna University of Technology) – the elevator lift. The idea was evolved during the first student competition in 2006. Such a BAS as it can be seen in picture 2 has not been manufactured or integrated in a railway vehicle yet and therefore would provide high innovative character.

Picture 2 – Elevator lift



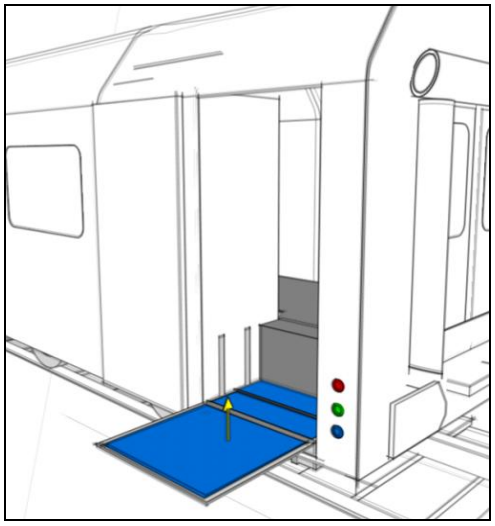
Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 12

But here again, the more detailed technical analysis led to the result that an elevator lift solution is not applicable for the very narrow doors (width and height) which are used in classical UIC-wagons and all other high floor trains. Therefore the elevator lift was no longer taken into consideration for the new BAS prototype.

2.3 Step lift

A step lift solution was the third design concept the consortium had chosen for a more detailed technical feasibility study. The step lift presented in picture 3 was submitted to the student contest held by TU Vienna at the beginning of the project. Usually, step lifts are used in buildings but some of them are also used in special vehicles like library buses. So the idea of using a step lift as design concept for the new BAS prototype sounded very promising to the PDG.

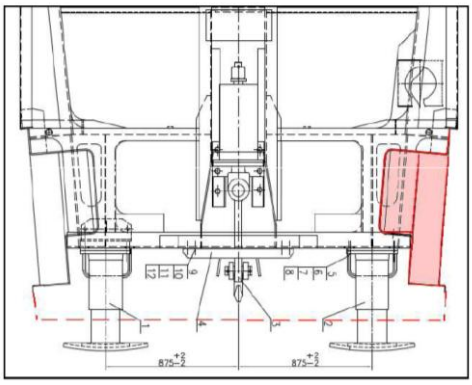
Picture 3 – Step lift



Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 14

Due to missing installation space especially under the steps in the entrance area of the UIC-wagon the step lift solution turned out to be not applicable for installment in classical UIC-wagons (see also picture 4). Therefore the PDG decided to no longer take into consideration this design concept.

Picture 4 – Drawing of steel frame of the end of a standard UIC wagon



Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 15

2.4 Sloping mast lift

Additionally to the above described design solutions, the Prototype Development Group decided to take some other design concepts into closer consideration in order to find an appropriate design for the prototype which can be incorporated into classical UIC-wagons.

So the first additionally design concept of three new ones taken into closer consideration by the PDG was the sloping mast lift solution (an example of a sloping mast lift can be seen in picture 5).

A most convincing point in favor of this system is its simple, linear motion sequence as well as its single-piece platform. This way additional movements (e.g. folding out several platform components etc.) could be avoided, reducing the sources of mal-function or failure when operated. Furthermore most of the movements of this lift have already been automated. Therefore the design concept of a sloping mast lift sounded very promising to the PDG.

Picture 5 – Sloping mast lift

Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 16

Unfortunately it turned out that the sloping mast lift solution is also not applicable for classical UIC-coaches and all other high floor trains again due to the missing installation space in the entrance area of these trains.

2.5 Hinge lift

The second additional conceptual design proposal (of three new ones) chosen by the Prototype Development Group for a more detailed feasibility study is based on a hinge lift solution which was submitted to the student competition of the TU Vienna (see picture 6). The design of this hinge lift appeared very innovative to the PDG. Lifting and lowering are achieved by two powered hinges. Lifting and lowering of the platform could be generated by an electrical spindle drive. The lift has a single-piece platform so that additional movements

(e.g. folding out several platform components) become obsolete. As additional innovative step, a seat for persons with reduced mobility is integrated. Regarding to the growing part of elderly in society in the upcoming years, this additional benefit made the lift very attractive as design concept for the PDG.

Picture 6 – Hinge lift

Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 18

As more technical analysis have shown that a hinge lift solution is not applicable for classical UIC-coaches and all other high floor trains due to the missing installation space in the entrance area of these trains, the hinge lift was erased from the list of possible design concepts for the new BAS.

2.6 Moveable twin pillar linear lift

The third additional design concept was based on a moveable twin pillar linear lift solution which is already installed in a commuter train in Switzerland (an example can be seen in picture 7).

All movements of this lift have already been automated. Lifting and lowering is generated by hydraulic cylinders. The lift has a single-piece platform so that additional movements (e.g. folding out several platform components) are unnecessary, which is an advantage of this system. Additionally a handrail is provided. The lift could be equipped with sensitive edges

and light barriers to secure the automated movements. The lift is stowed alongside the door and will be moved to the door opening for usage.

Picture 7 – Moveable twin pillar linear lift

Source: D.4.2 Vehicle-Based BAS Preliminary Design Recommendations, p. 19

Again, more detailed design and technical calculations showed that a moveable twin pillar linear lift solution is not applicable for classical UIC-coaches and all other high floor trains due to the missing installation space in the entrance area of these trains. Therefore the moveable twin pillar linear lift was also erased from the list of possible design concepts for the new BAS.

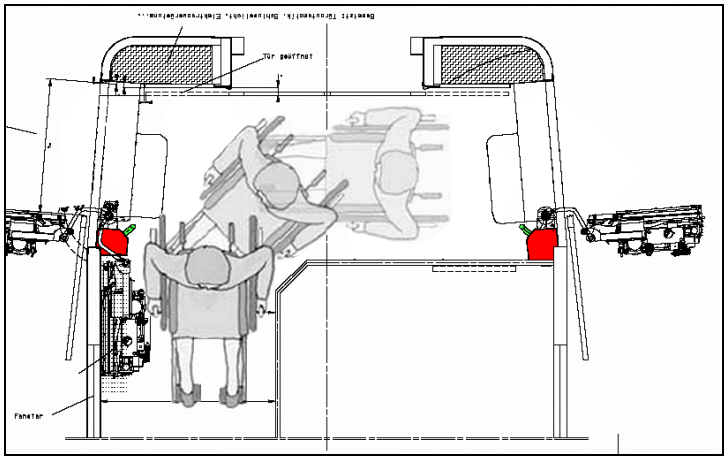
2.7 Swivel lift

The last conceptual design concept taken into closer consideration for the new BAS prototype for classical UIC-wagons is based on the well known swivel lift concept which is widely acknowledged in the railway market. They are mainly fitted into trains but some technical variants are also fitted into vans or minibuses.

Installation investigations and technical calculations led to the decision that the swivel lift concept is the best suitable design concept for the restricted space conditions in classical UIC-wagons. Therefore this concept was chosen by the consortium members of PubTrans4All for the new design concept of the BAS prototype.

In general, a UIC wagon shall be equipped with a total of two boarding assistance systems (one 270°variant and one 180°variant) in the future allowing boarding and alighting on both sides of the wagon (design study displaying both lift variants see picture 8). The two BAS will be located on both sides in the entrance area of the UIC-wagon. In the PubTrans4All project, only the 270°variant of the BAS prototype will be built and tested as it is the more technical complex case.

Picture 8: Entrance area of a standard UIC wagon equipped with two BAS swivel lift



Source: D.4.3 Prototype BAS Development Report, p. 6

For being able to install the 270° BAS prototype variant into the UIC wagon provided by our project partner BDZ several modification works need to be done on the BDZ wagon:

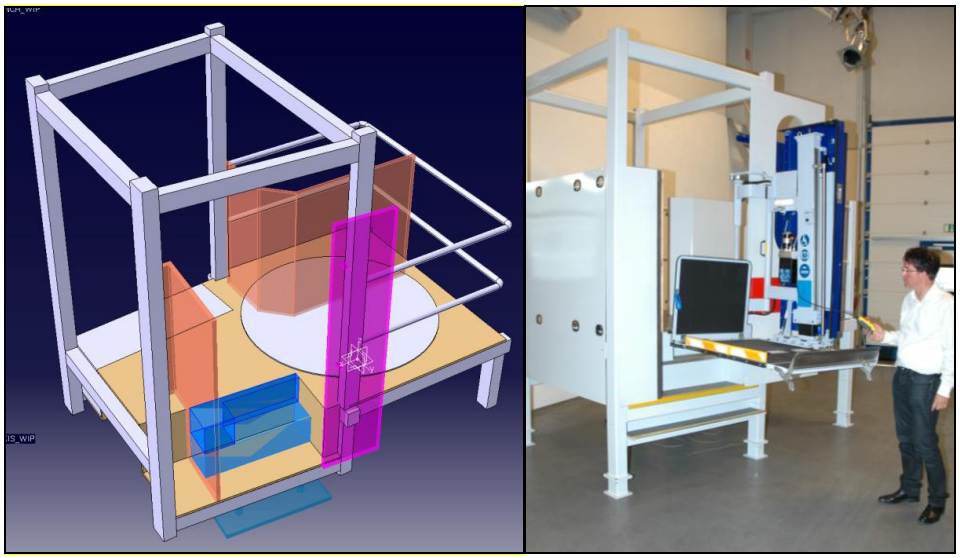
- The mechanical link between the mechanism of the entrance door and the folding step shall be removed and replaced by a pneumatic cylinder.
- The outside wall of the double wall of the toilet door shall be removed. This leads to more space necessary for better passage of the wheelchair user in the corridor.
- The inner wall at the end of the wagon shall be moved 40 mm towards the outside. This gives the BAS prototype enough space for the unfolding movement (while the front door is closed) and the 270° turning movement.

3. Building and testing the new BAS prototype – Current status and outlook

After finalizing the designing and building phase, the prototype was factory tested at the facilities of the lift manufacturer and consortium partner MBB Palfinger. This strict quality control and product testing in factory ensures that the prototype meets all required and necessary safety and operations criteria.

Therefore a test bench (welded steel construction) was built displaying all technical interfaces and restrictions of a classical UIC-wagon entrance area for testing purposes (see picture 9).

Picture 9: Design concept and real construction of the mock-up



Source: Presentation 5. PDG meeting, p .24 and Minutes 6. PDG Meeting, p. 9

Furthermore, the test bench displays 1500 mm space for a turning circle necessary for wheelchair operations regarding TSI PRM. Therefore adjustments in the inner lining can be made. Both entrance situations (left and the right entrance situation) can be displayed on the mock-up so that the mock-up can be used after the project has ended. But for the demonstration of the incorporation and the operation of the 270° variant of the BAS prototype, which was the greater challenge of a BAS, only one side of the mock-up was used for demonstration purposes.

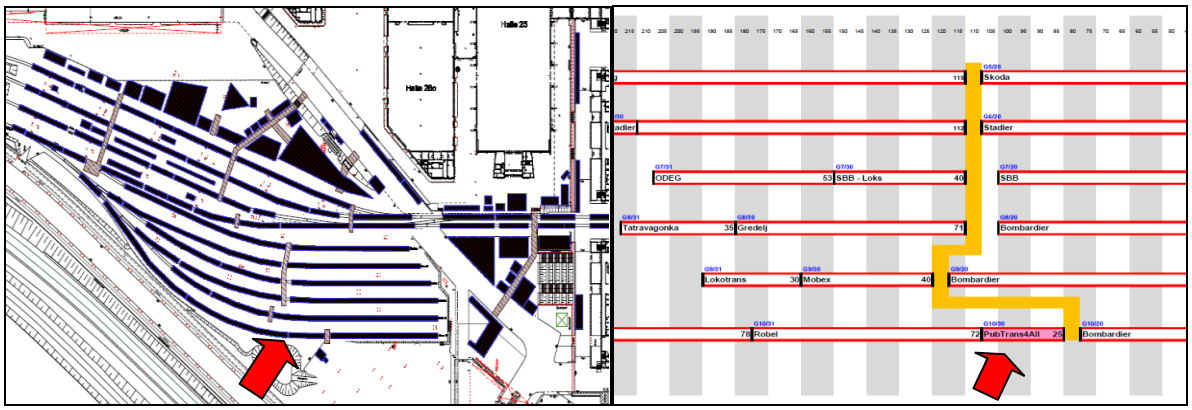
Picture 10: Factory testing of the new BAS prototype

Source: MBB, 6. PDG Meeting, 22.05.2012, Hoyenkamp

After finalizing factory testing (see picture 10), the prototype of a new BAS has been shipped from our lift manufacturer and consortium partner MBB Palfinger in Germany to our project partner BDZ in Bulgaria. Here, the prototype is in course of incorporation in a UIC-wagon of the Bulgarian State Railways and thereafter will be tested on the railway network in Bulgaria.

The prototype of a BAS incorporated into the UIC-wagon will be displayed to the interested public at the InnoTrans, from 18th to 23rd September 2012 in Berlin. In picture 11 the red marks show roughly the position of the PubTrans4All UIC-wagon with the incorporated prototype at the outdoor exhibition area of the InnoTrans 2012.

Picture 11: Allocation of tracks and outdoor displays at the InnoTrans 2012



Source: Information material for main exhibitor published by InnoTrans 2012

If you have any more questions or remarks concerning the project “PubTrans4All – Public Transportation for All” please do not hesitate to contact us by email: office@rodlauer.eu or take a look at our website www.pubtrans4all.eu .