# ERGONOMICS CONSIDERATIONS IN THE DESIGN OF A PERSONAL RAPID TRANSIT

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## INTRODUCTION

The paper deals with new transport systems PRT (Personal Rapid Transit) and brings to attention their most important characteristics. PRT systems seem to be a potential future solution to public transport problems in cities. What is understood by the concept of PRT is a means of transport combing the features of both mass and personal city transport of a 'point to point' or 'door to door' type (i.e. there are no intermediate stops between the initial and final stops). PRT transport is realized by small four-passenger vehicles which are remotely-controlled and move on a light infrastructure – usually an elevated track What has been particularly emphasized is the issue of ergonomics and the minimalisation of adverse vibration impact on human body. We have presented an exemplification of a PRT vehicle cabin construction and results of computer simulation of the vehicle dynamics during the manoeuvre of changing a straight track into a curved one..

## METHODS, EXAMPLE RESULTS

The fundamental assumptions for the construction of a PRT system in Poland (the design is being developed by Warsaw University of Technology and is called SITIN) are as follows:

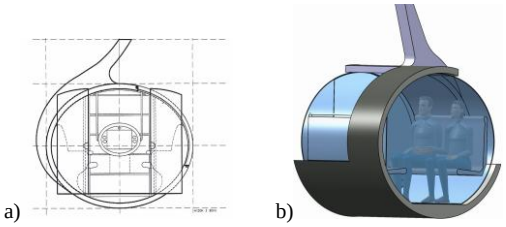
1. maximum velocity: about 50 km/h, the separation distance of 10 m (these parameters ensure high traffic capacity of the system)
2. PRT system will make use of four-passenger vehicles
3. switches are of paramount importance in PRT systems as they make it possible to change the direction of a journey. Switches are to be passive without any movable elements. The PRT vehicles will be equipped with special mechanisms which will enable the change of a direction of a journey
4. the guideways network for PRT vehicles is a two-layer one and consists of Layer One (containing the so-called main arterial lines along which vehicles move with a constant velocity of about 50 km/h and separation distance of 10m) and Layer Two (containing lines where vehicles move with lower velocity (0-50 km/h) and where the basic 'door to door' idea of transport is realized, i.e. the transport of a passenger from a specific location at the beginning of his journey to the exact point of his ultimate destination.
5. the velocity of a turn from Layer One to Layer Two should not delay the traffic in the main arterial line and should not cause some unacceptable effects such as the effect of ill-balanced acceleration and the so-called jerk (caused by the change of acceleration speed). It will be necessary, therefore, to make use of some transitional curves.
6. PRT vehicles must have geometrical parameters complying with ergonomic requirements and enabling the transport of the disabled (in special cases the entry of a wheelchair together with an accompanying person is possible after the seats have been folded), also their equipment should ensure a comfortable and safe journey.

This paper focuses on research concerning the postulates expressed in points 5 and 6. To successfully design an ergonomic vehicle which would comply with the expectations of its users it is necessary to consider the following stages in its construction:

1. the selection of a suitable shape and dimensions of the vehicle
2. the proper equipment of the vehicle as far as the comfort and safety of the journey are concerned
3. the provision of the comfort associated with the internal environment of the vehicle which affects a passenger ( physical factors, for instance noise, vibration, lighting, microclimate)

This work contains:

1) Anthropometric analysis and design of PRT cabin shape (see fig.1).
2) Analysis of the equipment of a PRT vehicle concerning comfort and safety of a passenger.
3) Comfort of a journey connected with the internal environment of a PRT vehicle.
4) Selected problems of the construction and dynamics of a PRT vehicle (for this purpose we built simulation model (in ADAMS Software)



a) b)

Fig.1 Lateral view of PRT vehicle, b) Preliminary visualization of PRT

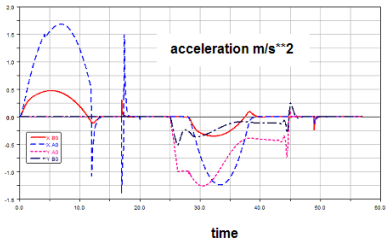



Fig.2 Impact of accelerations on passenger X (along traffic direction), Y (across traffic direction). The remaining symbols: A – a symmetric model with no shock absorbing system on a cabin B – a symmetric model with a shock absorbing system provided on a cabin, 0 – kinematic input resulting from track geometry.

Example results of simulation (acceleration acting on passenger in curving motion) are shown in fig.2

## CONCLUSIONS

The ongoing analyses and research work indicate, that the PRT system is a potentially interesting solution to traffic problems which might compete with the existing public transport systems. However, the implementation of the system requires further intensive research and planning work of interdisciplinary nature.