

AUTOMOTIVE SERVICES CENTRE FOR THE DISABLED PERSONS – REVIEW OF RESEARCH AND DEVELOPMENT WORKS IN 2015-2020

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Summary

In 2020, there was the 5th anniversary of establishing, by the Director of the Motor Transport Institute, the Automotive Service Centre for the Disabled Persons together with the National Information Point, the only information, training and research centre in Poland, supporting the community of people with physical disabilities in the area of mobility. This study is an overview of the research and social work to date, scientific publications and pro-social tasks that contributed to the development of motorism in this social group. Such activities are part of the mission of the Institute, which coordinates and promotes scientific research and development works in the field of road transport, while developing innovative technical, organizational and economic solutions. ASC is an example of an innovative comprehensive organizational solution, based on the needs of people with disabilities.

Key words

disability, transport, automotive, research

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1. Introduction

Poland, by implementing the provisions of the Convention on the Rights of Persons with Disabilities, has the task of creating appropriate conditions for the development and participation in social life by the people with disabilities, on an equal footing with able members of society. Therefore, state support should include multi-level non-financial and financial assistance through medical, psychological and technical care, as well as social assistance.

These important challenges related to the Convention were taken up by one of the leading scientific institutes in Poland - the Motor Transport Institute, establishing in 2015, an information, training and research unit called the Automotive Services Centre for the Disabled People (ASC), which supports the community of people with motor disabilities, involving important government and local government institutions, non-governmental organizations, companies from the automotive industry, adaptation and Driver Training Centres. A Nation-wide Automotive Service Information Point was also created, where people with disabilities, their families, driving instructors, examiners, certifying doctors, vehicle dealers, adapters and other interested persons can obtain professional advice on important issues related to transport. Leading specialists and experts in the field of road traffic safety, transport psychology, vehicle diagnostics, training, testing and vehicle adaptation had been invited to cooperate.

2. Research and development projects

Thanks to the involvement of the Motor Transport Institute, the following research projects were carried out in the years 2013-2020:

- A comprehensive system of supporting the mobility of people with physical disabilities (AMC-2). Co-financing by NCBiR, INNOTECH Program. As part of the project, the research was carried out on the needs of people with reduced mobility in terms of their mobility. It was necessary to apply an innovative approach to the design and modification of vehicles for this group of users. The starting point was the diagnosis of needs and proposing the criterion of dysfunction. [19].
- Assessment of psychophysical abilities of people with disabilities. Re-

search methodology. Co-financing from the Ministry of Science and Higher Education. As part of the study, the psychophysical abilities of drivers with motor disabilities were tested [20].

- The use of innovative technological and material solutions in the construction of RETECH wheelchairs. Co-financing from the National Centre for Research and Development, Program Demonstrator+. The main objective of the tasks was to select the optimal parameters of the co-extrusion or counter-extrusion processes of Mg alloys, determining the degree of extrusion, the achievable speed of the piston rod and the outflow speed together with the temperature of the ingot for extrusion as well as tools and the press container to make products for the wheelchair composition as part of the design [21].
- Supporting the mobility of disabled people by launching the Automotive Service Centre. Use of MTI funds. The aim of the study was to analyze the situation of drivers with disabilities in Poland in the context of the road safety [11].
- Supporting the mobility of disabled people - activities within the Automotive Service Centre for Disabled Persons at the Motor Transport Institute. Use of MTI funds. The objective of the work was to analyse the needs of disabled drivers and candidates for drivers with respect to the automotive services (including Drivers' Training Centres, Vehicle Inspection Stations, petrol stations, etc.) and to analyse the legal status regarding regulations on the inspections of vehicles adapted to the needs of people with disabilities and the method of conducting technical tests [12].
- The system of comprehensive support for disabled people in terms of their mobility - diagnosis, proposed system changes, implementation of the provisions of the Convention on the Rights of Persons with Disabilities with respect to the personal mobility in Poland. MTI. The aim of the study was to diagnose the mobility needs/barriers faced by the persons with disabilities, making it difficult for them to live self-sufficient and independent life, and to propose actions aimed at improving both the situation of drivers/passengers/pedestrians and broadly understood road safety. Preparation of recommendations for socio-professional changes in connection with the development of new technologies and elimination of barriers resulting from the lack of knowledge and awareness of the functioning of people with physical disabilities [8].
- A diagnostic and functional stand for drivers with disabilities and tests of adaptation devices based on the vehicles' fleet of the MTI Automotive Service Centre for Persons with Disabilities. Co-financing of the Ministry of Science and Higher Education. As part of the work, a stand was developed for the stationary functional diagnostics, testing technical parameters of adaptive devices, and a methodology for individual selection of adaptive devices for drivers with motor disabilities was developed [9].
- Evaluation of the possibility to use autonomous vehicles to expand the mobility of disabled persons. Co-financing by the Ministry of Science and Higher Education. The aim of the study was to indicate for which types of disabilities it is possible to ensure the mobility of disabled persons, using cars with various degrees of autonomy [14].
- Vehicle instrumentation selection system for a disabled driver. Co-financing by the Ministry of Science and Higher Education. The main objective of the project was to create a uniform system enabling the selection of a personalized set of vehicle instrumentation for a disabled driver. The specific objectives were as follows: diagnosing, using computer software, the personal abilities of a disabled driver; developing a method of detecting discomfort; verification of the selected adaptations by testing available devices in the vehicles [10].

- Commissioning the development of descriptions of innovative market qualifications together with validation tools and solutions in the area of the internal quality assurance system for awarding qualifications, including: Organizing mobility assistance based on the identified needs of persons with disabilities. The cost of the development was covered by IBE.
- Training for the employees of public transport sector in the needs of persons with special requirements, including persons with disabilities. Operational Program - Knowledge Education Development (POWER). Co-financing from the Ministry of Family, Labour and Social Policy [18].
- Development of a prototype of an electric bicycle for persons with disabilities. Co-financing from PFRON funds. The vehicle's prototype is an intermediate solution between a single-track vehicle and a three-wheeled vehicle. It allows to move around like on a classic bicycle, and when the need arises, the bicycle stabilizes itself like a tricycle. The bicycle is characterized by a comfortable and stable position of the cyclist on a comfortable seat. The two-wheeler has a sensitive and precise propulsion assistance. It also has an unprecedented method of stabilization, especially while standing still [13].
- Analysis of the operation and development of the ASA (Adaptation Selection Automation) system using the method of measuring the phenomenon of discomfort among drivers with disabilities. Co-financing from the Ministry of Science and Higher Education. The main objective of the project was to assess the correctness of the ASA (Adaptation Selection Automation) system operation by using the method of measuring the phenomenon of discomfort among drivers with disabilities. The research conducted will allow to improve both tools, using for this purpose vehicles belonging to MTI (project under construction).
- *Discomfort measuring method of drivers with disabilities - results of preliminary research, 2020* [1].
- *The procedure for selecting adaptive devices supporting driving by a disabled driver, 2018* [3].
- *Evaluation of the possibility of using autonomous vehicles for expanding the mobility of disabled people, 2018* [2].
- *„Functional tests” as an element of determining the ability to drive a vehicle by person with disabilities, 2017* [6].
- *Technical inspection of vehicles with adaptations intended for people with disabilities. Pilot survey among diagnosticians of vehicle inspection stations, 2016* [4].

Thanks to the innovative and pro-social nature of the Automotive Service Centre for Persons with Disabilities in the area of mobility of disabled persons, the Institute received the following prestigious international and national awards and distinctions:

- Gold Medal - Invent Arena 2018 an International Invention Fair in Trzyńnic [15].
- Award - Rehabilitation and Rehabilitation Equipment Fair - REHexpo 2018 [16].
- Silver Medal - iENA 2018 International Invention Fair in Nuremberg [17].
- The Bronze Laurel of Innovation 2018 in the Stanisław Staszic Competition for the best innovative products in the category: services and other solutions, innovations of a socio-economic nature.

4. Characteristics of activities and the ASC equipment

The ASC has in its resources specialized vehicles with adaptive devices, stationary adaptation devices and a three-wheeled electric bicycle (a project co-financed by the State Fund for the Rehabilitation of Disabled Persons), which are presented in Figs. 1-7. Specialized vehicles have become the basis for establishing the first rental in Poland of vehicle for drivers and passengers with disabilities (the rental cost included only the cost of operating the vehicle with adaptation and servicing by the employee).

3. Publications and awards

Thanks to the involvement of the Institute's research staff, several dozen publications on mobility have been written describing many research and social issues. It is worth mentioning a few current topics, namely:

- *The use of autonomous vehicles for drivers with various motor dysfunctions, 2020* [5].

Fig. 1. Demonstration and diagnostic stand - set 1



Source: Motor Transport Institute

Fig. 2. Demonstration and diagnostic stand - set 2



Source: Motor Transport Institute

Fig. 3. Demonstration device, mechanically controlled



Source: Motor Transport Institute

Fig. 4. Demonstration device electronically controlled



Source: Motor Transport Institute

Fig. 5. Demonstration and diagnostic stand - set 1



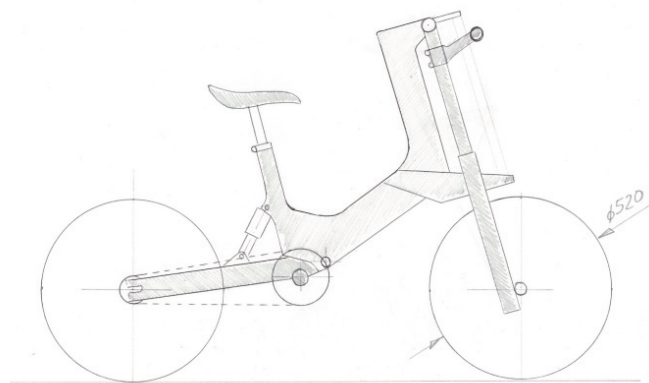
Source: Motor Transport Institute

Fig. 6. Demonstration and diagnostic stand - set 2



Source: Motor Transport Institute

Fig. 7. Electric bike, project 2019-2020 [7]



Source: Motor Transport Institute

Fig. 8. Types of CL170 decelerometer adapters



Source: Motor Transport Institute

As part of the ASC research, another version of the CL170 decelerometer, (an instrument for testing the braking performance), was prepared. The device used by Vehicle Inspection Stations has been additionally equipped with „adapters” mounted on adaptive devices adapted for vehicles of people with disabilities (Fig. 8).

The ASC makes changes at every level of functioning of persons with disabilities. Improvement of the conditions in mobility contributes, to a large extent, to taking up professional obligations and develops interpersonal contacts of people with special mobility needs.

In 2016, the MTI began to cooperate with the State Fund for Rehabilitation of Persons with Disabilities in the following areas: implementation of the provisions of the UN Convention on the Rights of Persons with Disabilities ratified by Poland, implementation of activities aimed at introducing into the training system of employees and cooperating institutions, the issues related to persons with disabilities, conducting undertakings supporting people with disabilities and their families in terms of their automotive mobility. From June 2018, it became one of the signatories of the Partnership for Accessibility, thus committing itself to cooperate for implementing the assumptions of the Accessibility Plus Program.

At the request of various institutions, the Institute prepares opinions and

expertises in the field of motorism of people with disabilities, participates in Parliamentary and Senate committees. One of the last ones was the opinion prepared on the draft resolution of the Council of Ministers for the adoption of the document - Strategy for Persons with Disabilities 2020 - 2030 (II.2. Mobility, II.2.3. Comprehensive support for individual mobility of people with disabilities). The document is an important element of the long-term policy of the State in the field of assisting people with special needs to move about. The issues developed by MTI as part of the Strategy were fully accepted and introduced into the document.

Until the establishment of the Automotive Service Centre for Disabled Persons, there was no institution that would comprehensively address the automotive needs of people with transport difficulties. Increasing the intensity of its work, the Institute also implemented subsequent programs:

- professional internships for people with disabilities,
- student internships for students of the Warsaw University of Technology and the Military University of Technology,
- training for ASC partners,
- training courses for students of the Warsaw University of Technology, the War Studies University and the Military University of Technology,
- training courses for primary and secondary school students.

The Centre is developing dynamically, setting the directions of activities and presenting the Institute's potential as a socially responsible „business”, combining the functional (social) aspect with the research aspect. Strategic changes have taken place in the recent years and they referred to many areas of life, including transport. Further initiatives are planned that will significantly increase access to services with respect to, e.g., driving license training. This unique place becomes the creator of reality and implements modifications also in the field of legislation.

For the last 5 years, the society of persons with disabilities has been using the knowledge and experience of people who are open to help with mobility, find solutions to problems using the support of a psychologist, but can also obtain a professional diagnosis of their functional state in the discussed area. Thanks to their efforts, these people feel well prepared to fulfil many life roles and can fulfil their automotive dreams.

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