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Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

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VACUUM TRANSPORT SYSTEM FOR MARS

Abstract

One of the biggest problem arising for colonists on the Mars is people and goods transportation. The problem will exist inside every colony and between them. In the paper vacuum transport technology Hyperloop type is presented.

On the Mars conditions are much more severe than on the Earth. Martian transportation system have to cope with extreme temperatures ($-140C \div 40C$), dust storms, low pressure (around $600 Pa$ on the surface) and many other challenges unknown at the moment. In the paper conditions important for transport on Mars are discussed in details and problems of implementation of vacuum transport technology on the Red Planet are formulated. Theoretical calculations will be shown.

The paper presents also a conception of usage local materials for vehicle manufacturing and infrastructure building. Potential solutions to many technical problems will be proposed, including the power supply system, safety of the passengers and scheme of new railroad system. Different components such as stations, infrastructure, rolling stock, energy supply and security will be described. An implementation plan and approximate costs will be presented. Also the profitability of the system will be proven in comparison to other means of possible Martian transport systems.

Proposed vacuum transport system was desired for Mars colonies concept presented on January 2020 by Robert Zubrin and Elon Musk. The original idea presented by Elon Musk was to move the wagon at the speed of $1200 kmph$, in an environment with reduced pressure.

This paper is based on own idea of the first author originally defined in the year 2013 and then developed by group of 20 young engineers involved in the subject at Wrocław University of Science and Technology. The concept was named in polish language as Pierwszy Polski Pociąg Próżniowy - First Polish Vacuum Train, shortly 4P – FOR PEOPLE. Solution is cheaper and easy to implement than original Hyperloop concept. It was proven that 4P is more affordable, applicable and profitable than Hyperloop for Earth conditions and also for the Martian. Presented solution of vacuum transport system was based on the series of dozen technical papers prepared for polish conditions as well as for other countries not only in Europe.

The concept can be used for Mars conditions as well as for the Moon.