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Transportation system of the future

Transportation is an enormous industry and this industry is anticipating great changes associated with the following three basic factors.

Firstly, there are changes in the general situation on the planet caused by the problem of energy resources. Actually, modern transportation is almost fully dependent on the availability of oil resources that have been quickly depleting so that at last the time will come when they would become inaccessible for transportation use. Various means proposed to improve the efficiency of oil use could just postpone but not prevent this moment. Transportation system of the future should be “omnivorous”, i.e. to begin with the use of relatively cheap oil fuel at the early stages of its development, then to come either to electrified operation or to transfer to the alternative types of fuel or other sources of energy.

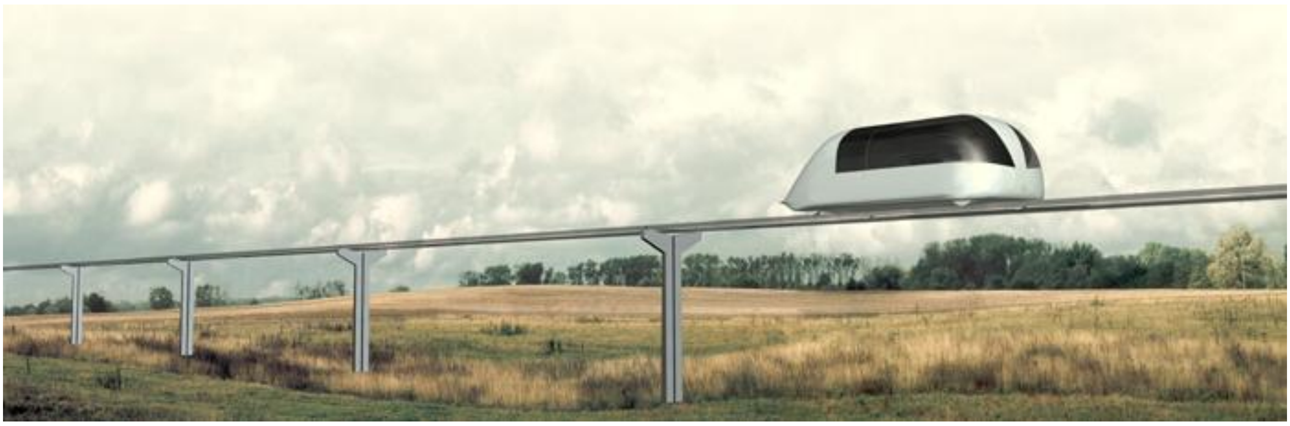
The second factor which dictates the need in transformations is associated with the current state of the world transportation system itself and, in particular, with some of its key standards, for example, the rail gauge, that were laid down as early as in the 19th century. As a result, the whole system has become obsolete because all changes were either insufficient or unimportant without changing the system foundations.

Thirdly, in the 21st century the global problems of ecology and security are likely to become even more pressing and in this case the growing scales of transportation use make it the most dangerous invention of the humankind. Let me give just two examples: 1) more than 1 million people are killed every year as a result of transportation accidents (out of them about 950,000 people are killed on motorways), about 5 million become disabled or cripples (whereas the average number of people killed in wars including the world wars amounts to about 500,000 per year); 2) In the USA alone the total area covered by asphalt and concrete for roads (the total length of which is more than 5 million km) is equal to the territory of Greece. All these lands are not capable to breath and generate oxygen. At the same time the amount of oxygen burned out in transportation engines is more than that generated by green plants growing on this territory.

Therefore, there is an urgent need in a new transportation system based on new technologies and new standards that will be capable to bring about radical changes in the means of carrying people and freights.

A future transportation system intended for carrying passengers, small- and large-tonnage freights should meet a great number of contradicting requirements such as: high carrying capacity with small land allocation requirements and low maintenance and repair costs; minimal negative environmental impact alongside with high daily mileage of traffic; high average travel speed alongside with lower fuel consumption and reduced number of road accidents; suitability of tracks for the circulation and maneuvering of public and individual transportation.

In this respect “Unitsky String Transportation” (UST) could become a transportation system capable to meet the requirements of the 21st century.



High-speed passenger UST module, travel speed – up to 350 km/hour, carrying capacity – 15…40 passengers

UST – is a principally new multi-purpose communication system designed as a pre-stressed stretched cable-and-beam structure installed on the supports at the height of 1…50 m and more. The basic component of the system is a one- or double track structure proposed for the circulation of freight and passenger wheel transportation modules operating on electric motor or internal combustion engine.

Fig. 1. UST in the town of Ozyory, Moscow Region, October 2001. Module simulator – modified automobile ZIL-131 with the total weight of 12 tons

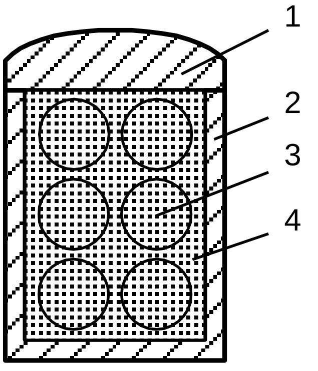


Fig. 2. Cross-section of a string-rail: 1 – rail head; 2 – envelope; 3 – string; 4 – filler

The key component of a UST track structure is string-rails (Fig. 2) designed as a joint-free rail. The string of a rail is pre-stressed (stretched) to the strength of 100…500 tons and rigidly fixed between anchor supports put with a span of 1…3 km between them. In the spans between the anchor supports the track structure is supported by the light supporting piers. Optimal distance between them is 20…50 m, maximum – 2,500…3,000 m.

Fig. 3. High-speed module, travel speed – up to 450 km/hour, carrying capacity – 5…25 passengers

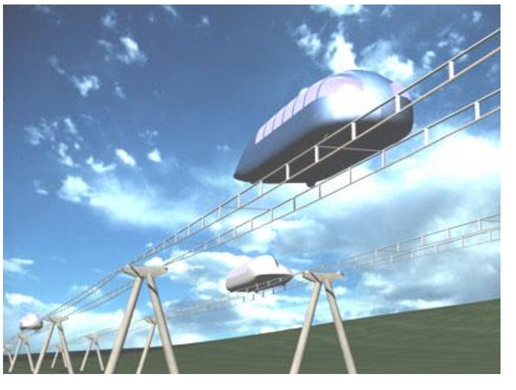


Fig. 4. High-speed module, travel speed – up to 400 km/hour, carrying capacity – 30…60 passengers

Fig. 5 Freight echelon for bulk freights, speed – up to 150 km/hour, mass – up to 1,000 t

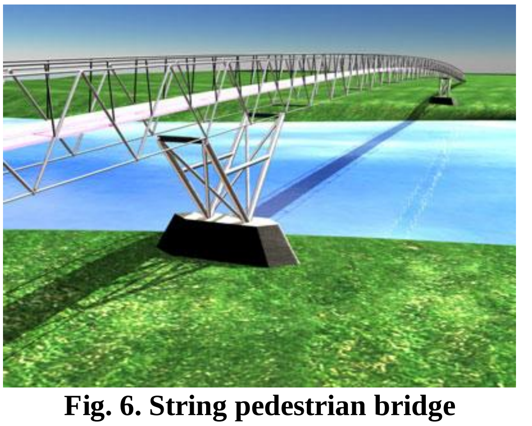


Fig. 6. String pedestrian bridge over the water barrier

Key technical-economic and ecological indices of a double-track UST road:

- Low material consumption: 100…250 kg/m of metal structures; 0.1…0.3 cub. m/m of reinforced concrete;
- Insufficient land allocation requirements – 0.01…0.05 ha/km;
- Low cost of passenger traffic (USD 0.4…1.0 per 100 pass.·km) and freight traffic (USD 0.6…1.2 per 100 ton·km);
- Low construction costs (not including infrastructure):
  - Low-speed routes (up to 150 km/hour): on a plain – 0.5…1.0 mln. USD/km, in urban areas or mountains – 1.0…2.5 mln. USD/km;
  - High-speed (150…500 km/hour): on a plain – 0.8…1.5 mln. USD/km, in urban areas or mountains – 2.0…3.5 mln. USD/km; for coastal areas (on a shelf under the water) – 2.5…4.0 mln. USD/km, in a tunnel – 8…15 mln. USD/km.
- Carrying capacity: more that 100,000 passengers per 24 hours (during "peak-hours" – up to 20,000 passengers/hour) and more than 50,000 tons of freight per 24 hours (more than 15,000,000 t/year);
- Low fuel consumption with high travel speeds (for example, 0.2…0.3 l of fuel per 100 pass.·km at the travel speed of 200 km/hour);
- Profitability of operation: 100% and more with the pay-back period ranging from 2 to 6 years;
- Possibility to build low-cost technological routes intended for various purposes such as: ore delivery to the concentration plants; coal transportation; oil delivery to oil refinery plants; garbage removal beyond the limits of megalopolises; delivery of high-quality natural drinking water to densely populated regions;
- Possibility to use the UST supports and track structure for the location of solar or wind power plants that could generate energy for UST as well as location of electric power transmission and communication lines including fibro-optical ones;
- Construction of UST eliminates the need in embankments, depressions, demolition of existing buildings, unrecoverable felling of woods; it does not cause damage to agricultural lands and water bodies.
- String routes are the most environmentally friendly and ecologically clean mode of transportation to be used in urban areas, national parks and nature reserves, large-scale woodland areas of taiga and jungles, tundra and marshlands, in mountains and deserts.
- A series of UST transportation modules was designed to be used for various purposes including: freight for carrying liquid, friable and piece freights; passenger modules intended for intra-city, suburban and high-speed inter-city transportation (Fig. 3-5, 7).
- In terms of the level of comfort provided for its passengers a high-speed passenger module could be comparable to a railway sleeping car whereas the cost of its serial production will be at the level of that of a conventional automobile (USD 2,000…3,000 per 1 seat) and the cost of travel will not exceed the cost of a ticket in a suburban train.
- Passenger modules could be designed as many-seat (10…60 passengers) vehicles or as special-purpose cars for smaller number of seats including individual or VIP category vehicles.
- Safety of travel could be comparable to that of air transportation (the annual number of people killed as a result of air crashes is on the average by 500 times less than the number of killed as a result of road accidents).
- All-weather operation – UST is not subject to the impact of wind, rain, snow, hail, ice, fog, sand or dust storms.

UST technologies enable construction of low-cost, fast-built pedestrian crossings, highway and railway bridges, overpasses and ferries (Fig. 6).

UST is likely to become one of the most environmentally safe, low-cost, highly profitable, fast-built, industry-generating transportation systems of the 21st century, opening up a strategically profitable sphere for investments.

UST programme has been developed under the auspices of the UN (registration numbers of the projects in the UN data base are: FS-RUS-98-S01 and FS-RUS-02-S03).

To finalise experimental design and construction works and to get an access to the market of transportation services it is necessary to certify the UST on a pilot section. To fulfill this task under conditions of Russia it is necessary to have the investments in the amount of USD 30 million for the years 2003…2005.

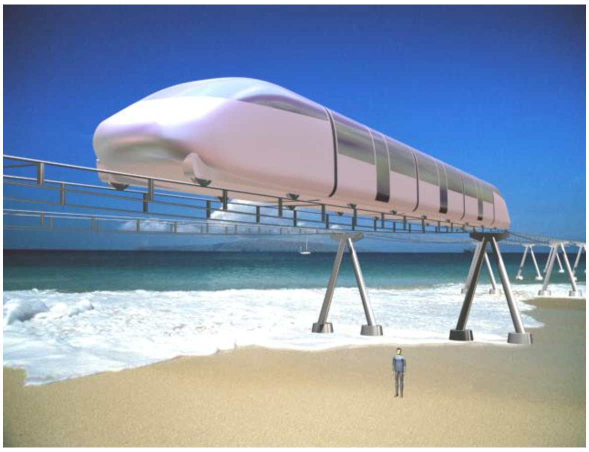


**Fig. 7. Passenger UST train,
travel speed up to 350 km/hour,
carrying capacity – up to 500 passengers**

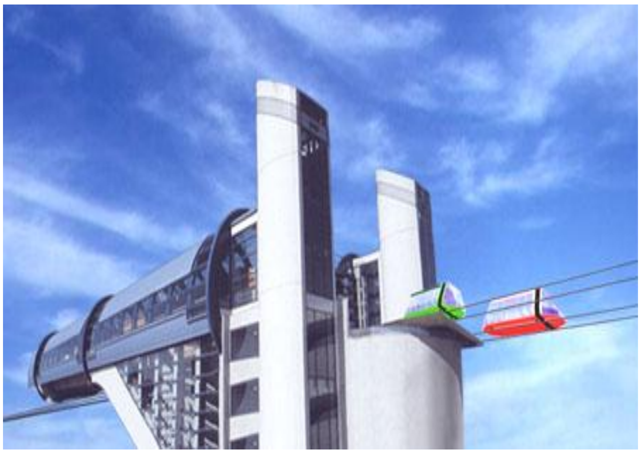


**Fig. 8. UST route on the great height
(50…100 m and more) under conditions of a city**

When the UST has been certified, Unitsky's Company will be ready to fulfill customers' orders for design and construction of low- and high-speed UST routes of various purposes: freight, passenger, intra-city, suburban, inter-city, freight-passenger, excursion, etc., pedestrian crossings, bridges and overpasses for any mode of transportation including ferries.

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