

THE TRUTH CONFIRMED BY GERMAN WUPPERTAL

Technologies of the XXI century

Two noteworthy events occurred in SkyWay Technologies Co., the team of which is engaged in the implementation of a new type of transport – safe in its concept and extremely efficient: comfortable high-speed pods move along a special rail, elevated above the ground to a substantial height.

Firstly, a presentation of high-speed unibus produced by this company took place in Berlin, at the world exhibition InnoTrans 2018. Secondly, the traditional annual festival of investors was held at EcoTechnoPark, and they fully supported the trend in which this major innovative structure is developing. These events became a motive for the meeting of "Zvyazda" correspondent with the Chairman of the Board at the closed joint-stock Company, General designer of a promising project Anatoly Yunitskiy.

The exhibition in Berlin showed that the use of blockchain technologies, operations with BigData, creation of automated control systems with the possibility to adapt the movement schedule to passenger traffic, innovative developments in the construction of infrastructure, creation of additional services for people with limited mobility and much more demonstrate the systematic approach of SkyWay and are aimed at a comprehensive inclusion in the rapid transformation processes of local and global transport system.

Introducing the interloctor:

Born in 1949 in the village of Kryuki, Bragin district. He says that after the Chernobyl accident it is the most polluted territory in the Gomel region, a compulsory evacuation zone. Now there is nobody and nothing there. "I lost my little homeland." He moved over to Kazakhstan together with his family at the time when the virgin land started to be cultivated there. They lived near the Baikonur Cosmodrome. Apparently, this was the motivation of his passion for space and the first steps in rocket engineering. At the tenth grade he made a rocket that rose to a height of several kilometers. And the very first Honorary Certificate, the dearest one, was issued by Jezkazgan District Komsomol Committee for an operating rocket launch ground.

So the love for inventions is initiated from there.

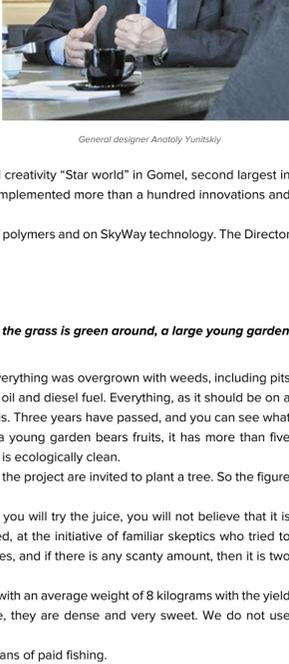
A transport worker by education, he studied at the Tyumen Institute of engineering and construction, then moved over to the Belorussian National Technical University (BNTU). He was always fond of exact sciences – theory of strength of materials, mathematics, physics, chemistry.

He worked in the road-building trust of Gomel, built bridges and roads. He headed the patent service at the Institute of mechanics for metal polymer systems under the Belorussian Academy of Sciences in the city of Gomel.

A member of the USSR Federation of cosmonautics. The organizer of the first World Conference on non-rocket industrialization of space. 500 people participated, including 4 cosmonauts. Based on the results of the conference, the film director from Belarusfilm studio Yuri Khashchevatsky has done a documentary "To the sky by wheel" for the funds from the USSR Goskino (State Cinema Committee). It was shown in cinemas of the USSR and abroad.

Anatoly Yunitskiy has created the Center of youth scientific and technical creativity "Star world" in Gomel, second largest in Belarus. Using a grant from the Soviet Peace Fund, its participants have implemented more than a hundred innovations and earned about five million rubles for one year.

He is the author of many inventions on the research work at the Institute of polymers and on SkyWay technology. The Director of two UN projects.



General designer Anatoly Yunitskiy

Tank range becomes unidrome

– Anatoly, we are talking at the well-kept grounds of EcoTechnoPark – the grass is green around, a large young garden is nearby ...

– Quite recently, there was the site of an abandoned tank range, where everything was overgrown with weeds, including pits two or three meters deep, caponiers, and the grass was burned with fuel oil and diesel fuel. Everything, as it should be on a tank range. No one needed such land, and we bought it on a bidding basis. Three years have passed, and you can see what has changed. The land is absolutely different, mowed grass is around, a young garden bears fruits, it has more than five thousand fruit and berry trees. We collect a good harvest, and everything is ecologically clean.

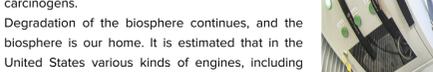
By the way, the garden was planted by our investors. Those who invest in the project are invited to plant a tree. So the figure of five thousand is not random.

This year, we harvested 10 tons of juicy, tasty fruits in the garden. When you will try the juice, you will not believe that it is without added sugar. So sweet the apples are. They were recently tested, at the initiative of familiar skeptics who tried to catch us on fertilizing, and it turned out that there are practically no nitrates, and if there is any scanty amount, then it is two times lower than in European standards.

We have not only planted gardens, this year we have grown watermelons with an average weight of 8 kilograms with the yield of 100 tons per hectare. They have their own, slightly different structure, they are dense and very sweet. We do not use fertilizers, all grows on our pure soil and on our humus.

And nearby there is a lake with trout and red fish – for our own staff and fans of paid fishing.

Thus, we show that SkyWay is on friendly terms with nature. Our project to create SkyWay transport is "green" and eco-friendly. We do not destroy, but save the soil. The project is implemented at the expense of investors under the crowdinvesting scheme, and investors, ordinary people, want to see their planet still green, alive and without any threats.



The child of technological progress fits perfectly into the environment.

... On the green lawn there are sculptures of people, which influenced the fate of the project. General Lebed, General designer's longtime business partner. Russian businessman Dmitry Terekhin. A large sign of zero kilometer, because our talk partner believes that it is right from here that a new promising transport technology will begin to evolve around the world. Therefore, a capsule with a kind-hearted message to descendants is mured down.

- What else have we managed to do for this period? - continues his story Anatoly Yunitskiy,

- We have built five test tracks: a cargo suspended line, two passenger tracks, a super-light one ... With all the infrastructure: stations, terminals, depots.

The Company has its own office – a four-storey building where our personnel work including numerous project designing bureaus. Our SkyWay Technologies Co., which is a part of SkyWay Group of Companies, is an engineering entity, it is not engaged in investments, it is only a developer. It employs project engineers and designers. This is our line of work.

They design passenger, urban, high-speed (and now also hyper-speed, when 1,200 km per hour shall be reached in a special tube) and cargo transport. They are designing fundamentally new overpasses that differ from traditional flyovers, bridges and viaducts. Another difference is that they have no concrete joints. It is an overpass, where there are only two rails, and there is no roadbed, because at high speeds it worsens aerodynamics by 2.5 times due to the pressure that appears under the vehicle bottom. Usually 95 percent of the vehicle's energy is spent on aerodynamics. We are also designing our own brake systems, control systems, our own energy "stuffing", tooling, technological equipment and so on.

And also our own engine – a motor-wheel that rolls along a steel rail. Therefore, it is not a monorail or a cable way.

There is a whole range of differences, as a result of which, for example, we reduced the cost of tracks tenfold, improved the energy efficiency of transport compared to a car by five to seven times. To do the same work you need to spend five to seven times less energy and fuel. We have removed almost all the harmful impacts on the environment – we have neither emissions, nor fumes characteristic for asphalt. There is no tire wear, and the smallest particles of rubber, like soot, do not get into human lungs. Noise is also reduced.

Thus, we have provided a high environmental friendliness of our vehicles, raised its efficiency, reduced the prime cost and travel fare – price of the ticket. At the same time, the accessibility of transport will increase – our stations will be within the city. We can make cities completely pedestrian. People will not perish under the wheels of cars.

Moreover, rolled the soil on the land, equal to five UK territories, is today down under asphalt and sleepers in the world. And nothing grows on this land. Nearby territory is also polluted because automobile emissions contain more than one hundred carcinogens.

Degradation of the biosphere continues, and the biosphere is our home. It is estimated that in the United States various kinds of engines, including those for aircraft and rocket launches, burn up more oxygen than trees and green plants growing here manage to produce it.

There are no barriers in the biosphere, and the US steal oxygen for themselves in Brazil and Russia, which are the "lungs" of the planet. Yes, our Belovezhskaya Pushcha (Belarusian Biosphere Forest Reserve) and green Polesye help the planet to breathe, too.

– What is the specific feature of the new technology, revolutionism?

- It is a sector marker, it creates a new industrial branch. It requires its own infrastructure. Any car can be released from an enterprise, and it will go. We need our own track, our own stations and so on. It is a complex, which will operate at the second level, above the ground surface. Ground is traditionally considered the first level.

– Tell me, is the main point of the idea in the motor-wheel, or not only?

- The main thing is not the vehicle, but the overpass. It is uncut and pre-stressed. Under it, there is no ballast that "steals" the soil.

As for the motor-wheel ... When I was deciding what to take as an engine, I analyzed everything – magnetic cushion, air cushion, pneumatic tire, steel wheel; I even wanted to "harness" anti-gravity. I stopped on a steel wheel with its special design – a cylinder rolls on a plane. Compared to the railway wheel the loss in movement is reduced twofold.

Due to what is it moving? It is powered by an electric motor inserted into the wheel. We have developed these motor-wheels with permanent magnets ourselves, as they have a high efficiency at small sizes and a high torque, which is very important. We design and produce them ourselves – with power from one to two hundred kilowatts, because there are no ready-made solutions for it.

And with the diameter of 300 to 600 millimeters – this is for high-speed transport.

Yunitskiy's triad

– Would you please justify your triad: cost-efficiency, environmental friendliness and safety of the project.

- Efficiency is directly related to the environment. If it is cost-efficient, it is environmentally friendly. And vice versa. Cost-efficiency breaks down into several components. Firstly, the overpass, which is less-costly than the traditional ones tenfold, I spoke about it already. Accordingly, it requires ten times less materials. As a result, you need less ore, fewer open-pit mines, metallurgical plants, so as to extract all this, deliver, melt out and distribute further along the technological chain and consumers. You can build ten times more tracks for the same funds. The economic efficiency of our system is five to seven times higher than that of road transport, at least by fuel consumption. Certain models, accelerating to 500 kilometers per hour, consume only about six liters per one hundred kilometers, which is unprecedentedly little.

This is achieved due to the high efficiency factor of the "steel wheel – steel rail" system, and also because the pod moves along the overpass. Due to this, as well as due to the unique shape of the vehicle, by improving the aerodynamic quality, the developers were able to achieve the index Cx = 0.05, which is close to the theoretical limit. The "toughest" car in the world – Bugatti, worth 3 million euros, has Cx = 0.42 taking into account the spoiler. We have it eight times better. The motor in the two-seat car has more than three thousand horsepower with a fuel consumption of 100 liters per hundred kilometers. So, compare.

The size of our stations for passengers is less than usual. They are compact (respectively, less-costly), because passengers do not need to wait at the station. Why are there so many people at the airport? Because they are waiting for two or three hours for their flight. With us it is – you came, took your seat, started riding.

In general, all elements of our infrastructure are more cost-efficient than those of traditional ones.

– Your comments on the safety subject, please.

- Today, the highest accident rate is in road transport. The car is on the first level where things are humming. The car wheels are kept on the road only due to the force of friction, the road has no anti-ruinout system. Add the human factor to this, and here you have more than a dozen reasons for an accident. There is a sad statistic. Today, one and a half million people perish on the world's roads and more than ten million become disabled and crippled. Kalashnikov assault rifle and the atomic bomb killed less people. For a hundred years there will be more than a hundred million killed and more than a billion crippled. Think about these numbers. We can save these people. So that people do not die! So that you drive from work and to work without fear. So that your children would play outside, and you would not be afraid for them.

The second level increases safety by a thousand times. Our transport is completely trouble-free, it runs above the ground, and there are no causes for accidents on the routes.

Our vehicles are unibus, unibike and others, the model range is expanding, they cannot run off their rails, because they are equipped with an anti-derailment system. Figuratively speaking, our wheel is holding on to the rail.

In addition, the absence of the human factor – control is done by automation, which is duplicated many times.

– Actually, are your vehicles electric cars?

- Which have brains – an intellectual control system. It is also duplicated. It has a technical eyesight, other "sense organs", and it knows how the components and units work at any particular moment. More precisely how they should work. And if something went wrong, the signal goes to the control system and the dispatcher, the situation is adjusted and instantly corrected.

We do not have a runway and birds above it, as in aviation. We are not afraid of a ball lightning. And there are no other reasons for accidents that occur on the railway, in aviation, on motor-roads ... The system is more anti-vandal-resistant, our support cannot be destroyed with a tractor, it has a tenfold margin of safety. It has eyes and ears, sees and understands everything. If an outsider gets closer to a support, it will immediately respond to his appearance. It will be the safest transport in the world.

Through the eyes of Europeans and ... Japanese

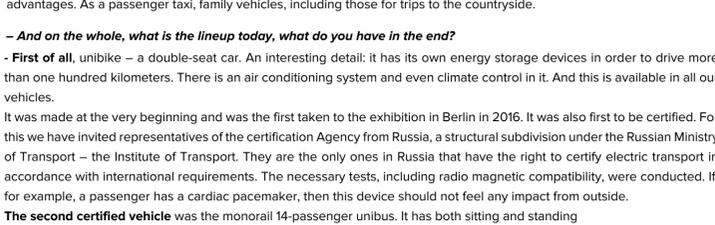
– Please, let's get back to the exhibition in Berlin.

- This year at the 2018 Innobrans exhibition in Berlin, we held the world premiere of our high-speed unibus – unilyot, it is exactly the vehicle that is capable to reach speeds of 500 kilometers per hour. It has six seats in the unibus version. This is something fundamentally new in the world of rail transport. Unilyot made a real sensation at the exhibition, where more than three thousand companies participated. Such as Siemens, Hitachi, Toyota and other famous brands.

At the same time we showed our 18-passenger unicar.

The stand of the Belarusian company SkyWay Technologies has become the most visited. It is not by chance that Japanese television showed its audience a video shot at the exhibition highlighting that Belarusians have invented a unique technology. So, even the Japanese have acknowledged. Although it is difficult to surprise them with anything.

SkyWay high-speed and other solutions were noticed and carefully examined by representatives of all major companies among the exhibitors. They highly appreciated the potential of the technology and noted that SkyWay has no analogues by the range of its possible application. Our display stand was one of the most visited. We had numerous meetings with colleagues and negotiations with companies interested in promoting the new technology.



Cabins launch their "flight" from this hall

The model range of new products

– Are you launching your new product for the first time today?

- The double-seat uniwind, in super-light system. This is a new pod and a new track. Right now we are completing to work over it. You can compare it with the "Lada" conditionally. In addition to passengers, it can carry up to two hundred kilograms of cargo. And it is millions of tons a year. The line is easy to assemble, it is simple in design and rather cheap. These are its advantages. As a passenger taxi, family vehicles, including those for trips to the countryside.

– And on the whole, what is the lineup today, what do you have in the end?

- First of all, unibike – a double-seat car. An interesting detail: it has its own energy storage devices in order to drive more than one hundred kilometers. There is an air conditioning system and even climate control in it. And this is available in all our vehicles.

It was made at the very beginning and was the first taken to the exhibition in Berlin in 2016. It was also first to be certified. For this we have invited representatives of the certification Agency from Russia, a structural subdivision under the Russian Ministry of Transport – the Institute of Transport. They are the only ones in Russia that have the right to certify electric transport in accordance with international requirements. The necessary tests, including radio magnetic compatibility, were conducted. If, for example, a passenger has a cardiac pacemaker, then this device should not feel any impact from outside.

The second certified vehicle is the monorail 14-passenger unicar. It has both sitting and standing places. This is already a public transport, urban and intercity, with the speed of 150 km/h, as in a unibike. You saw it today, too.

The third pod is unicar with six seats. You can make with it a train of any length, with several sections. Therefore, unicar was certified in two versions – in six-seat and eighteen-seat versions.

The fourth carriage, which was certified this year, is the suspended 48-passenger unibus. With two lounges, seated and standing places.

And the **double-seat uniwind**, we just talked about it. It can be called a people's car in the long term. This is the last pod, which is being tested presently. It will pass the certification procedure very soon.

Let's not forget that we have also produced a **high-speed unibus**, six-seater, family type. We have exhibited it in Berlin, where this unique vehicle caused admiration of experts as the most innovative innovation throughout the whole exhibition. I repeat: an entire television program to our success was broadcast in Japan, and not a word in Belarus.

We are preparing it for testing. Unfortunately, we were not allocated land at home, in Belarus, to continue the current track up to 21 kilometers, otherwise we will not get 500 kilometers per hour. After all, you need to accelerate ten kilometers, and the same distance to slow down.

We have received land for an experimental track in another country, we will build a high-speed track there and we will test it there. And the vehicle is ready.

Our vehicles are all different both in appearance, in design and in characteristics. Although all of them are electric cars. Now Tesla electric car has been widely advertised. Our pod is 5-7 times more efficient. By energy consumption, environmental friendliness and other parameters. And Tesla is more complicated: there is no AC system in it, and we have it.

Something about marketing

– What is your marketing policy?

- I can say that orders for cooperation come from different countries. We also plan to arrange transportation of sea containers in ports, both 20-foot and 40-foot ones, weighing up to 35 tons. Therefore, we have designed and begin to produce unicon – technology for container haulage. And since we do not have such tracks for these unique vehicles here, we will manufacture them in a country where we will build a high-speed route. The new technology will be tested for particular orders. Let me disclose a secret: in a tropical climate where there is neither winter, no snow – with specific requirements to the rolling stock.

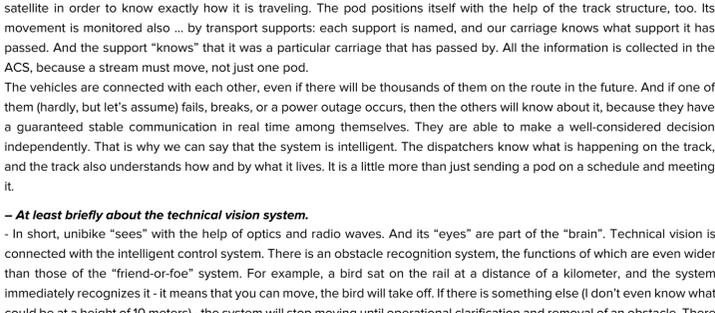
And since we have many orders for urban systems, we have designed and are already working on the next more solution that will be completely different, we are not promoting it yet. I can only say that at the beginning of the next year it will be delivered to customers.

There are also many orders for the haulage of bulk cargo including ore, rubble, other building materials. Therefore, we have designed a suspension line to transport bulk cargo with a vehicle of 25-ton capacity. And correspondingly, tracks for it. Now we have a lot of applications for "heavy" routes and "heavy" vehicles to transport large volumes of passengers and cargo.

Therefore, we have plans on designing and producing more universal passenger transport, which will be formed into trains – with a capacity of up to 300 people. The speed will be traditional – up to 150 kilometers per hour. We will help cities to solve transport problems with these articulated unibus-trains; they will be double-rail, both suspended and mounted. Neither trams, nor even subway can solve them today. This can be seen even in Minsk in peak hours.

The above-mentioned is not all that we are doing. There is also a shuttle-type unibus for riding on steep slopes, up to 30-degrees gradient in mountains. We have designed a catamaran, which can also be useful in mountainous terrain. And a number of other new products. It is just important to understand that we consider our business to be promising and do not limit ourselves within the framework of what is visible at our proving ground. If we do not create new technologies all the time, then they will quickly catch up with us and surpass us. We do our best not to let it happen. We believe that today we have the right to say – we have surpassed everyone and forever. We are leading not by one, but by ten steps ahead of the competitors.

The main thing that allowed to do this was the team, the school, the knowledge that members of our team have – project designers, engineers and builders. We have created our own scientific school, we have our own project designing school and engineering school. These schools are created and operate in Belarus, but they are international, because Russians, Ukrainians, Kazakhs are also working in our Company.



Strokes to the subject

– With your permission a few questions on details. Please explain the automated traffic control system.

- We create it ourselves, the programs were also written by ourselves. A part of it is an onboard control system. With sensors, radars and technical vision. In addition, there are fiber-optic communication lines. Plus, a computer that monitors and controls everything. Also the control room and the whole of it is almost a living organism distributed along the route. By the way, the role of the dispatcher is not reduced to management, it is primarily control. If necessary, he can take control. But normally automatics works. An itinerary task is written, and the vehicle operates in accordance with this task. The intelligent safety system also operates on the basis of an automated control system. The movement of our vehicle is controlled with a space satellite in order to know exactly how it is traveling. The pod positions itself with the help of the track structure, too. Its movement is monitored also ... by transport supports: each support is named, and our carriage knows what support it has passed. And the support "knows" that it was a particular carriage that has passed by. All the information is collected in the ACS, because a stream must move, not just one pod.

The vehicles are connected with each other, even if there will be thousands of them on the route in the future. And if one of them (hardly, but let's assume) fails, breaks, or a power outage occurs, then the others will know about it, because they have a guaranteed stable communication in real time among themselves. They are able to make a well-considered decision independently. That is why we can say that the system is intelligent. The dispatchers know what is happening on the track, and the track also understands how and by what it lives. It is a little more than just sending a pod on a schedule and meeting it.

– At least briefly about the technical vision system.

- In short, unibike "sees" with the help of optics and radio waves. And its "eyes" are part of the "brain". Technical vision is connected with the intelligent control system. There is an obstacle recognition system, the functions of which are even wider than those of the "friend-or-foe" system. For example, a bird sat on the rail at a distance of a kilometer, and the system immediately recognizes it - it means that you can move, the bird will take off. If there is something else (I don't even know what could be at a height of 10 meters) - the system will stop moving until operational clarification and removal of an obstacle. There is a whole collision avoidance system in action. In fact, driving our vehicles is easier than driving a car. The main thing is to maintain the same speed, keep a distance with other vehicles and track obstacles. A hare will not jump on the track, the neighbor on the track will not move across, because it is not there, the tractor will not appear at the intersection, and a motorcycle neither ... The "eye" also keeps track of what is happening at the sides, and when there appears an object that is moving in the direction of the track, it will give a signal to prevent a collision. One of our unibuses is moving at a height of only 30 centimeters. There is a high probability to meet an obstacle in that place, and there is a big strain for the safety system there. But it copes with it. After all, it is equipped with a system to recognize images of humans and animals and can make a decision independently.

– You have your own production facility...

- Now we have purchased premises for production, where they tried to set up production of Yo-mobile. We've got bare walls, and now there is modern equipment standing there. Some models are unique, the only ones in Belarus. There is a laser cutting, the most modern welding equipment, unique machines, bending tools... We have converted the workshop and trained people in a short time. Some of them were retrained, because they were engaged in the production of cars earlier. We managed to produce about a dozen models of various vehicles at these areas in such a short period of time. Even the largest companies cannot brag of it. Eight to ten models of completely different vehicles that did not exist in the world. Four of them are already certified and ready for operation.

We have created the production of rolling stock and rolling stock elements. We make spaceframes of aluminum alloy and vehicle bodies of fiberglass. Windows of polycarbonate and ordinary glass. Motor wheels. We are even making the seats ourselves. Since they are not traditional, they do not repeat what is available. If in some unibike models you can spin pedals and do fitness accelerating the pod up to 60 kilometers per hour, then it is clear that the seat should be adjusted to this function. We designed and made it. In the unilyot (high-speed unibus) the seats have massage and heating functions. It leans back and adjusts, it has a monitor on which you can watch movies, play games and work like on a computer. We also make many elements of the track structure ourselves. Composite rails are assembled by ourselves. We stretch strings in a hollow rail and fill it with a composite material. We do everything on the spot; our own building firm with trained personnel is doing it.

– Does the experience of the German Wuppertal prove the viability of your theory?

- The suspended railway in Wuppertal was built over a hundred years ago and is still in operation. The track passes through the city, two meters above the houses, you can touch it by hand. Above the streets, where thousands of people walk. Above the beaches where children swim. And it is safe.

– Was the traditional festival a success this year?

- This year more than five thousand of our investors arrived. They were satisfied, because they saw that I kept my word. I fulfill what I promised. At the same deadline, for less money and with high quality. They were convinced with their own eyes that the whole world knows about us, and this cannot be denied. Our investors are not rich people, they are students, pensioners, employees. Their contribution may be fifty or one hundred dollars, possibly more. Buying their share, they want to help us and are counting on the success of the common cause. They say: we support your ideology that the world should be green and clean. Safe. There are more than a million people who are not indifferent to the fate of the planet from 237 countries and territories. Thus, they confirm in practice that crowdinvesting has the right to life.

Authors: V. Khilkevich, Y. Pesetsky