



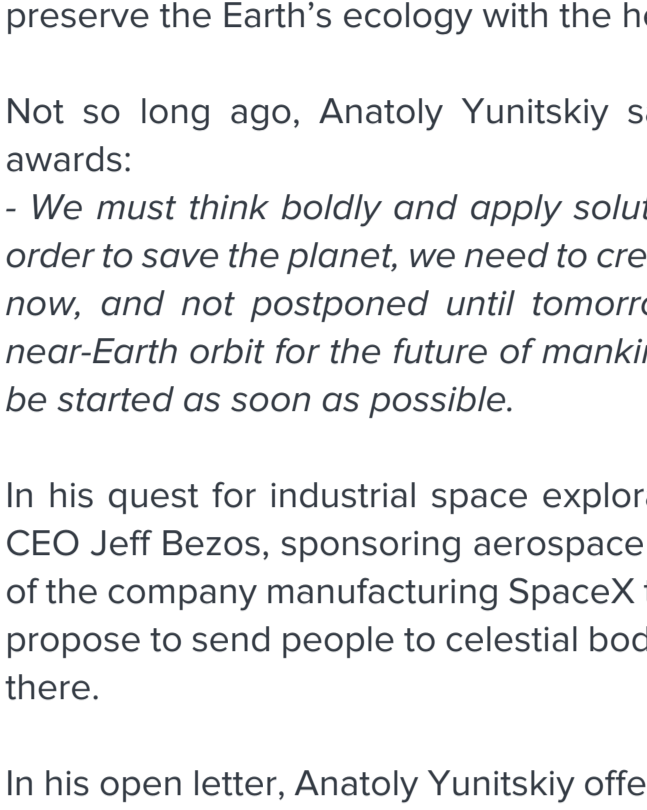
# Appeal to Jeff Bezos and Elon Musk: “We Must Save the Earth for Descendants!”

13 December 2018

*Inventor Anatoly Yunitskiy warns against mistakes and offers his own version of space exploration in his open letter*



Engineer Anatoly Yunitskiy is the author of SkyWay string transport concept. His project has recently grown from a small designing Bureau to a large Company in the field of research and development with test sites in Belarus and the UAE. Environmentally friendly and multifunctional SkyWay string transport is now ready for use: elevated track infrastructure has been tested, several vehicles have been certified and work is underway on high-speed and ultra-high-speed modules.



The concept of string transport appeared on the basis of another major idea - creation of a vehicle for non-rocket space exploration. Anatoly Yunitskiy has been developing it since late 1970s. The transport complex he came up with consists of an overpass encircling the Earth near the equator, and a telescopic ring with a linear motor located in it. With the help of centrifugal force, the engine will lift the extending ring from the surface of the planet and take it out into the Earth orbit together with a payload. According to the author's idea, industrial production facilities can be brought out into space and thereby preserve the Earth's ecology with the help of such General Planetary Vehicle.

Not so long ago, Anatoly Yunitskiy said at the presentation of one of European awards:

*- We must think boldly and apply solutions that seemed impossible yesterday. If, in order to save the planet, we need to create an alternative to a car, this should be done now, and not postponed until tomorrow. If industry should be taken out into the near-Earth orbit for the future of mankind, developments in this direction should also be started as soon as possible.*

In his quest for industrial space exploration, Anatoly Yunitskiy is not alone: Amazon CEO Jeff Bezos, sponsoring aerospace company Blue Origin and Elon Musk, founder of the company manufacturing SpaceX technology, are talking about such plans. They propose to send people to celestial bodies nearest to Earth in order to set up colonies there.

In his open letter, Anatoly Yunitskiy offers his vision of space exploration and tells why we should not look for a better life on Mars, but solve problems on Earth.

To: Mr. Jeffrey Preston Bezos, CEO of Amazon.com, Inc. and Blue Origin

Mr. Elon Reeve Musk, CEO of Space Exploration Technologies Corporation

as well as to all those who intend to proceed with a large-scale space exploration in the future using carrier rockets

Dear Sirs!

Your names are widely known all over the world, mine is less known. We are representatives of different cultures, citizens of far-away countries and carriers of different mentalities; we have different financial possibilities for investment in space exploration. However, there is something in common between us: just like you, I am confident that humankind has no other way of development than the exploration of outer space, but at the same time I believe that it is necessary to take the whole ecologically dirty industry out of the planet. Like you, I have devoted many decades to the implementation of an alternative space exploration program. In this period, as an engineer and scientist, I have achieved significant results and made a number of important conclusions that I consider necessary to share with you in order to warn against errors that could become critical for all of us – people of Earth.

### It is irrational and not environmentally friendly to explore space using rockets

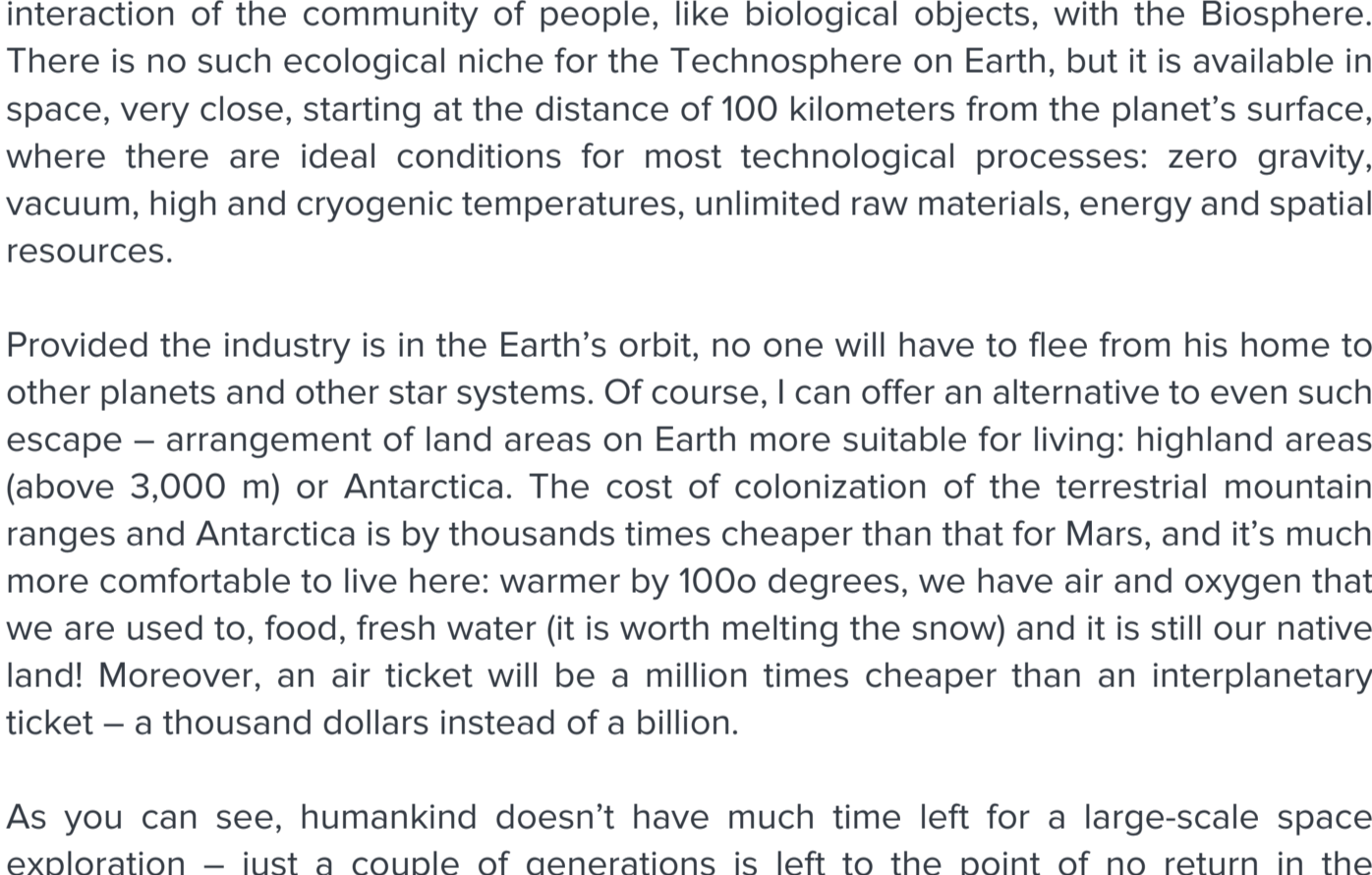
The rocket path of space exploration, along which mankind is proceeding today, and which you have decided to undertake, is a dead-end direction. Judging by data from open sources, the main goal that you are pursuing today is to reduce the launch cost by creating reusable carrier rockets. But even if you manage to achieve significant results and reduce the cost of delivering goods to the orbit, for example, to \$ 2 million per ton of cargo, a large-scale space exploration will still remain expensive. Here one can draw parallels with the earthly reality, where it is irrational to try building a factory at a cost of one brick comparable to the cost of a car.

Another circumstance that makes attempts to industrialize space using rockets senseless is their extremely low energy efficiency factor, less than 1% taking into account all the expenses and energy losses, including pre-flight and post-flight ones, for example, those to obtain fuel and produce detachable and lost sections. It sounds like a paradox, but the transportation performance of the entire modern rocket and cosmic industry is comparable to a single horse-drawn cart. Let us imagine such a cart that has continuously transported 1 ton of cargo since 1957 to the orbit (approximately 300 km). It would have transported up to date as much cargo as all the rockets together have delivered into space.

In addition to inefficiency, rocket cosmonautics also creates global environmental problems. The speed of jet exhaust at a rocket launch reaches 4 kilometers per second, which is five times higher than the speed of a sniper rifle bullet. The temperature of the jet flow reaches 4 thousand degrees, which is almost three times higher than the temperature of steel melting. All this power is released in an extremely vulnerable ozone layer in the form of chemically active flame. Each launch of a heavy carrier rocket makes in the ozone layer a hole the size of big European country, such as France.

Already 40 years ago it was estimated that the spaceship “Shuttle” can eliminate from 10 to 40 million tons of ozone in one launch (depending on ionospheric conditions), because it uses ozone-extinguishing chemical elements as fuel components. Given that there are about 4 billion tons of this gas in the Earth's atmosphere, it is easy to calculate that it will be sufficient to launch 100-200 carrier rockets of this type at a time for the complete destruction of the ozone layer. In addition to extinguishing ozone, rocket launches also change the physical chemistry of the upper atmosphere, causing turbulence in the ionosphere and even affect the geomagnetic field in the launch pitch plane.

Multiple use of rockets and the transition to new types of rocket fuel will not be able to solve these problems. For the industrialization of space with the current payload of rockets, the number of launches should be by several orders of magnitude greater than it is today – it will simply kill life on our planet. The forecasts on the launch of space vehicles for the next 10 years are not encouraging: 180 launches per year – this is more than a twofold increase from the current level. I do not want to believe that you see this scenario as a humanistic mission and the main business of life, implemented in the framework of the projects you supervise.



Humanity must find an alternative to rocket astronautics

### Man will kill the Earth, if we do not bring industries out into space

I suppose you understand and share my belief that the Earth will be doomed if in the near future the Technosphere (the entire industry) is not brought out into space, beyond the borders of our common home – the Biosphere. This will happen because it is fundamentally impossible to create closed cycles in the industry. It is about the same as seeking a way to prohibit a cow to produce manure, urine, methane and CO2 alongside with its main product – milk. It will not be possible to introduce a veto on the release into the environment of what remains as a result of subtracting the finished product (milk) from the raw material (grass).

All industrial technologies work in exactly the same way - they take raw materials, emit products from them (sometimes doing dozens and even hundreds of process stages), and what is left is thrown back into the environment. Even the Biosphere as a whole is not a closed system – after all, it has transformed the previously dead Earth. Similarly, the Technosphere as a whole cannot be a closed system under the conditions of a single planet. It will inevitably transform the planet for its comfort, without the need for oxygen, soil or other components necessary for human life on Earth. As a result, the Technosphere will kill, if not all life on the planet, then humanity - for sure. Even today, industries of the US and China consume twice as much oxygen as green plants produce in these countries. They live in debt consuming oxygen produced by Russian taiga and Amazon jungles. There is a forty-year tendency to shift the day of ecological debt (Ecological Debt Day) towards the beginning of the year. If it continues the Technosphere will irrevocably “eat” the Biosphere in 2-3 generations.

Only the provision of an ecological niche to the Technosphere outside the Biosphere will ensure for the latter preservation and development according to the laws and directions formed over billions of years of evolution, as well as the harmonious interaction of the community of people, like biological objects, with the Biosphere. There is no such ecological niche for the Technosphere on Earth, but it is available in space, very close, starting at the distance of 100 kilometers from the planet's surface, where there are ideal conditions for most technological processes: zero gravity, vacuum, high and cryogenic temperatures, unlimited raw materials, energy and spatial resources.

Provided the industry is in the Earth's orbit, no one will have to flee from his home to other planets and other star systems. Of course, I can offer an alternative to even such escape – arrangement of land areas on Earth more suitable for living: highland areas (above 3,000 m) or Antarctica. The cost of colonization of the terrestrial mountain ranges and Antarctica is by thousands times cheaper than that for Mars, and it's much more comfortable to live here: warmer by 100s degrees, we have air, and oxygen that we are used to, food, fresh water (it is worth melting the snow) and it is still our native land! Moreover, an air ticket will be a million times cheaper than an interplanetary ticket – a thousand dollars instead of a billion.

As you can see, humankind doesn't have much time left for a large-scale space exploration – just a couple of generations is left to the point of no return in the development of our technocratic civilization. After that, nothing would be able to restore the disturbed balance between nature and industry. Due to technocratic oppression of the Biosphere, its irreversible destruction and degradation will begin with the following degradation of the human race. After all, our Earthly civilization lives under the principle of “mould in a Petri dish” – after eating all the limited resources, it will die.

A large-scale space exploration and the transfer of the terrestrial industry into orbit will require geocosmic transportation in the amount of many millions tons per year. Neither today's thousand, nor tomorrow's ten thousand tons of cargo per year (as planned for rocket industrialization of space) will not solve the global problems of humanity living on the planet. By the time this volume is reached, 10 billion people will live on the planet, which in terms of one earthly soul will give us only 1 gram of space produce per year or 3 milligrams per day.

### There is a solution - General Planetary Vehicle

As a result of analyzing these problems, more than 30 years ago I came to the conclusion that the only possible transportation technology for a large-scale space exploration for humanity is the non-rocket method. You probably know the idea of a space elevator and other similar concepts. All of them are difficult to implement, at least in the foreseeable future; moreover, their performance capacity does not exceed 10 thousand tons of cargo per year. But I have my own solution, which you have probably also heard about.

It became widely known after my report in Moscow at a non-governmental meeting of American and Soviet public organized by the Soviet Peace Committee. This meeting was held in 1987, more than 30 years ago, and was devoted to the problems of transferring the Earth's industry into space without the use of rockets, as well as the development and colonization of other planets. Since then, I have done a lot of work, I have created my own scientific and design school, which became the basis for researching and verifying this solution by calculation methods. Due to this, the project can be implemented already in the foreseeable future provided there is a political will and consolidation of businesses.



General Planetary Vehicle will allow to take industrial production facilities out into space

The project was named General Planetary Vehicle (GPV). This is a reusable geocosmic transportation system for a non-rocket exploration of near space. It will allow to transfer about 10 million tons of cargo and 1 million people into orbit for one flight without any negative interaction with the environment and other on Earth space industry. GPV will be able to exit into space up to 100 times in one year. What GPV can do in one year, it will take about a million years for the modern world rocket and space industry, in which trillions of dollars have already been invested. At the same time, the cost of delivering each ton of payload to the orbit using GPV will be a thousand times lower compared to carrier rockets – no more than a thousand dollars per ton.

Environmentally friendly GPV, working exclusively on electric energy, will allow to carry out the industrialization of near space in reality. After that, it will be only necessary to close on the planet all industrial facilities that are harmful to the Earth's biosphere, having created them by that time in the near-earth orbit on principles that are environmentally friendly for space. This will open up tremendous opportunities in the sphere of informational and energy communications. Transfer of industry away from the planet will radically improve our common habitat, our common home – the biosphere of planet Earth, especially in industrialized regions – without any restrictions on production growth.

### The project will unite humanity

Almost all engineering solutions used in the project are widely known, tested in practice and are currently implemented in industry. The project's budget, calculated for a 20-year term, will be about two trillion dollars, which is not so much – three annual US military budgets. Such a global geocosmic program will make it possible to reunite all developed countries around the world with common goals and objectives involving them to finance this super-ambitious project designed to save humanity.



New transport system will work on Earth and in space

Due to its technical features, the project will directly affect the territory of dozens of countries, mainly located along the equator, and by its political and economic reasons, the project will affect the whole world. GPV will also become an indispensable platform for the future exploration of far-out space with reusable spacecraft, such as those ones being developed by your companies today. The project's implementation period will be about 20 years, taking into account sociopolitical, research, experimental, designing, surveying, building and assembling work.

I sincerely hope that you are like-minded people, who are not indifferent to the future of humanity and who are motivated to act not only by the interests of profit. You, as a few, should understand that in the event of the death of our common home, the earthly Biosphere, no money will save the lives of earthlings, their children and grandchildren. I invite you to cooperation for the benefit of all mankind. I hope this letter initiates the start of the main event in your lives, too.

Earth is the best planet in the entire universe. We must save it for descendants!

President of the SkyWay Group of Companies,  
Chairman of the Board of Directors and  
General Designer of SkyWay Technologies Co.

Engineer Anatoli Yunitski