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GENERAL PLANETARY TRANSPORT SYSTEM IS THE TOOL OF NON-ROCKET SPACE INDUSTRIALIZATION TO PREVENT PLANETARY ECOLOGICAL-RESOURCES CATASTROPHE AND TO ENSURE THE FURTHER TECHNOCRATIC DEVELOPMENT

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ABSTRACT
An ecological-resource catastrophe is inevitable, since the Earth civilization has chosen a technocratic path of development and objectively cannot refuse it. The basic industries of the Earth's technosphere, which has the most harmful anthropogenic impact on the Earth's biosphere, must be eliminated by newly build-up space industries. Boundless outer space, inexhaustibility of energy resources, as well as fundamentally new and unique technological conditions (weightlessness, deep vacuum, absolute purity, etc.) - determine the absolute price & quality competitive superiority of the upcoming space industry over the Earth's technosphere. So, we are talking about the ordinary market competitive mechanism of reindustrialization.
As for the multibillion civilization of people, it should stay to live in its biospheric home Earth, since the human body, as one of the systems of a complex biospheric complex, has been ideally "adapted" to earthly conditions over billions of years of evolution of living matter.
The feasibility of space vector of industrialization depends on many newly developed technologies, but the principal of them is geospace transport system, which should be distinguished by energy efficiency close to 100% efficiency, absolute environmental friendliness, cleanliness and safety, as well as the ability to develop the scale of cargo and passenger transportation, estimated at millions of tons of cargo and cargo. million passengers a year when the challenge of global reindustrialization is set.

Keywords: BIOSPHERE OF THE EARTH, SPACE VECTOR OF INDUSTRIAL DEVELOPMENT, GENERAL PLANETARY TRANSPORT SYSTEM (GPTS) OF ENGINEER A.E. UNITSKY, FEASIBILITY STUDY, TECHNOSPHERE OF THE EARTH.

1.INTRODUCTION
Anatoly Unitsky, author creator and general designer of General Planetary Transport System, devoted his entire life to saving Earth civilization from an impending environmental catastrophe, seeing the solution to all environmental and resource problems in the space vector of industrialization, the essence of which is "Earth is for Life, Space is for Industry".
An ecological-resource catastrophe is inevitable, since the Earth civilization has chosen a technocratic path of development and objectively cannot refuse it. The basic industries of the Earth's technosphere, which has the most harmful anthropogenic impact on the Earth's biosphere, must be eliminated by newly build-up space industries. Boundless of outer space, inexhaustibility of energy resources, as well as fundamentally new and unique technological conditions (weightlessness, deep vacuum, absolute purity, etc.) - determine the absolute price & quality competitive superiority of the upcoming space industry over the Earth's technosphere. So, we are talking about the ordinary market competitive mechanism of reindustrialization.
As for the multibillion civilization of people, it should stay to live in its biospheric home Earth, since the human body, as one of the systems of a complex biospheric complex, has been ideally "adapted" to earthly conditions over billions of years of evolution of living matter [1].
The feasibility of space vector of industrialization depends on many newly developed technologies, but the principal of them is geospace transport system, which should be distinguished by energy efficiency close to 100% efficiency, absolute environmental friendliness, cleanliness and safety, as well as the ability to develop the scale of cargo and passenger transportation, estimated at millions of tons of cargo and cargo. million passengers a year when the challenge of global reindustrialization is set.
The space-rocket transport complex of the Earth does not correspond and will never be able to correspond that task. Today, no more than 500 tons of cargo per year are delivered to space from Earth, and nothing (except astronauts and some scrap metal) is returned to earth. The results of the more modest transport activities of the global rocket and space industry, the efficiency of which does not exceed 3%, already have a tangible ecological ecology, and any consequences increase the volume of cargo transportation of the Earth's rocket and space biosphere simply cannot stand it.

2.GENERAL PLANETARY TRANSPORT SYSTEM DEVELOPED BY ENGINEER ANATOLY UNITSKY.

It is difficult to predict how technology will develop in the future, including space technology. The only thing that can be said with complete certainty is that whatever this technique may be, it will obey the fundamental laws of physics of our world. Such natural laws, repeatedly verified by practice, will remain valid at all times. In the field of mechanics, these include four conservation laws, to which all other particular conservation laws can be reduced, namely, energy, momentum, angular momentum, and motion of the center of mass of the system. [2].

In addition to the fundamental laws of physics, the geospace transport system must also meet a number of additional conditions and requirements: – should be made not as a stationary structure, but as an aircraft; - use only the internal forces of the system, minimizing any interaction with the environment, including excluding linear support on the earth's surface; - its efficiency should be close to 100%, the productivity should be millions, and in the future - even billions of tons per year; - during descent, it is capable of recuperating the potential and kinetic energy of space cargo and its own design; - must consume electrical energy, and the power of the drives of the geospace transport system in terms of a ton of cargo should not exceed 100 kW (for example, like a passenger electric car); - the acceleration and deceleration during geospace transportation should be comfortable for passengers and acceptable for cargo (no more than 1.5 m/s2), while the time to enter orbit and accelerate to the first cosmic velocity should be calculated in hours, not in days.

All the above conditions and requirements have been formulated and the only one engineering solution - General planet transport system (GPTS) have been developed by engineer Anatoly Unitsky more than 40 years ago and during this time it has been repeatedly studied and verified by calculation methods, which are described in detail in the author's popular scientific publications and in his monographs.

The GPTS is a toroidal structure with a cross section of several meters, encircling the planet in the plane of the equator and having belt flywheels in its core. Flywheels, accelerated by linear electric motors to cosmic speeds (about 10 km / sec.), due to centrifugal forces provide the necessary lifting force. Switching thrust from one flywheel to another causes the body of the GPTS to rotate around the planet, up to obtaining the first space velocity in a given equatorial circular orbit. When rising for every 100 km above the Earth's surface, the GPTS ring diameter increases symmetrically in all directions relative to the center by 1.57%, while the position of the GPV center of mass always remains unchanged and coincides with the center of mass of the planet.

GPTS is the only technical solution in which the transport system is capable of launching cargo into various circular equatorial orbits without the use of jet engines, using only the internal forces of the system, without any energy, mechanical, chemical and other types of interaction with the environment, i.e. the ultimate environmentally friendly solution for geospace logistics. For one flight, the GPTS is capable of putting into orbit about 10 million tons of cargo and 10 million passengers, who will be involved in the creation and operation of the near-Earth space industry. In one year, GPTS will be able to go into space up to 100 times. At the same time, the cost of delivering each ton of payload into orbit will be thousands of times lower than that of modern launch vehicles, and will amount to less than 1000 USD/t. That is, the cost of a passenger ticket to orbit will be within 100 USD with travel comfort exceeding the convenience of modern trains.

3.FEASIBILITY STUDY OF GPV GEOSPACE TRANSPORTATION

The cost price of GPTS geospace transportation consists of three main components: 1) the cost of electrical energy; 2) wages with taxes and deductions; 3) amortization deductions for the GPTS and for the equatorial transport-infrastructure complex serving it with a runway.

The total supply of energy required to lift the GPTS with a total mass of 40 million tons (one ton per linear meter) into near space, including the payload delivered into orbit with a mass of 10 million tons (250 kg / m), and return to Earth (already without payload) is approximately 4.2 × 1011 kWh. To provide the GPTS with starting electrical energy, it is more expedient to have its own power plants, which will allow it to be distributed within the geospace system at a cost of about 0.05 USD/(kWh). In addition, additional energy can be taken from the network of countries in the equatorial belt of the planet, through whose territory the launch overpass of the GPTS will pass. It is most profitable to do this at night, since nighttime tariffs are 2–2.5 times lower than daytime ones. The cost of the total energy Eo required for the first launch of the GPTS will be: 420 billion kWh × 0.05 USD/(kWh) = 21 billion USD, and the unit cost is 2100 USD/t.

Moreover, once accelerated flywheels can rotate inside the vacuum channels for years, because the magnetic cushion on permanent magnets, like vacuum, will not create resistance when they move at cosmic speeds. This means that the energy costs for the second and subsequent flights of the GPTS will be associated only with a part of the total energy proportional to the transported cargo, as well as with internal energy losses estimated not to exceed 10%. Although theoretically they can be reduced to 5% and even lower, to 1-2%. When the GPTS begins to rise, it will transfer energy to the terrestrial cargo, and when descending, by analogy with the falling water of a hydroelectric power station, on the contrary, the cargo from space will transfer its potential and kinetic energy to the GPTS. Considering that after the creation of the space industry in equatorial circular orbits, the main cargo flow will be carried out from space to Earth, the GPTS will begin to generate electricity, also operating as a giant dynamo with a total capacity of about 100 million kW.

From this it follows that the main specific energy component of the cost only for lifting a ton of cargo: E1 = 2100 USD/t × (25% of the GPTS gross weight + 10% losses in the Efficiency coefficient) = 735 USD/t. The main specific energy component of the cost only for lowering a ton of cargo will be equal to a negative value: E2 = 2100 USD/t × (-25% of GPTS gross weight + 10% of losses in Efficiency coefficient)) = -315 USD/t, since the descent cargo does not consume, but transfers its cosmic potential and kinetic energy to the GPTS. The main specific energy component of the cost of a round-trip flight with a full load: E3 = 2100 USD/t × (10% losses in Efficiency coefficient)) /two cargo transportations = 105 USD/t.

The GPTS and the equatorial airstrip will operate in automatic mode. However, keeping them running will require the creation of at least 200,000 jobs at an average wage, along with taxes of $50,000/year and annual total wage costs of $10 billion. The component of the unit self-cost (CUSC) in terms of wages with 50 flights per year with a full load of 10 million tons of cargo along the Earth-Orbit route (characteristic of the stage of the beginning of the industrialization of near space): CUSC = 10 billion USD/year / 50 flights/year / 10 million tons/flight = 20 USD/ton.
In terms of the complexity of equipment and the composition of components, an GPTS is generally equivalent to an electric vehicle (for example, a Tesla brand worth USD 50,000–75,000 and weighing 2–3 tons), the cost of a ton of construction of which does not exceed USD 25,000/t. Since the mass of the equipped GPTS (without payload) will reach 30 million tons, the capital costs for its creation (design and construction) will be equal to: 30,000,000 tons × 25,000 USD/t = 750 billion USD.
Once the space industry is fully operational and the exploration of asteroids and the moon as sources of raw materials begins, the need to deliver equipment and materials from Earth will decrease significantly. At the same time, the reverse descending cargo flow from orbit to the planet will significantly exceed the direct ascending cargo flow, since the main part of industrial products for earthlings is planned to be delivered from space. The GPTS will put less payload into orbit (the estimated load of one flight on the ascending route will be only 20%) and, first of all, will begin to rise into space precisely for the products produced there.

Therefore, subject to the operating conditions for the GPTS (50 years of operation with 50 flights per year; carrying capacity - 10 million tons; loading of the GPTS on the route up - 20%, on the route down - 100%), the gross volume of cargo transported in both directions for the entire the period of operation (depreciation) of the GPTS will be about 30 billion tons. Thus, amortization deductions per ton of cargo from capital investments in GPTS will be equal to: GPTS-ad = 750 billion USD / 30 billion tons = 25 USD/t.The length of the equatorial take-off and landing overpass complex (ETOLOC), including the equatorial string transportation and logistics, will be 40,076 km, of which approximately 20% of the length is land sections, 80% - sea. Since the GPTS is intended not only for spacewalking, but primarily for launching cargo and passengers into orbit, string transport and infrastructure communicators will appear along the equator on the planet and along the equatorial orbit in space, created according to the “5 in 1” principle. They will include complexes of urban, high-speed, high-speed and hyper-speed transport, energy and information communications and communication lines. Power plants, cargo-passenger logistics hubs, industrial and residential clusters will also be built, in which millions of people will live and work[3].

The cost of such a complex (including string transportation) built on planet Earth can be estimated at 1,320 billion USD, based on the fact that it will average 25 million USD/km on land and 35 million USD/km on offshore areas. Taking into account the total volume of cargo transported by the GPTS for the entire period of operation, amortization deductions per ton of cargo from capital investments in the string transport and communication part of the ground equatorial runway complex will be equal to: ETOLOC-ad = 1320 billion USD / 30 billion tons = 44 USD/t.
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4. CONCLUSIONS

An analysis of the data given in the Table 1 allows us to draw the following conclusions: the highest cost of geospace transportation (775 USD / t) in the first year of operation is associated mainly with the upward cargo-passenger flow. This, in turn, led to the absence of compensatory income from the generation of the descent, as well as the low volume of transported goods and passengers, which led to a high specific value of wage costs. Nevertheless, such figures will be more than 1000 times lower than those of launch vehicles in the most optimistic forecasts. As the volume of transportation, both direct and return, grows, their cost will begin to decline. In the tenth year of operation, when the cargo flow from orbit to the planet will significantly exceed the cargo flow from the planet to orbit, the unit cost of transportation will turn out to be negative. This means that the GPTS geospace complex will bring profit not only as a transport, but also as a giant linear kinetic power plant with a length of more than 40,000 km, with belt flywheels with a total mass of 20 million tons, capable of recuperating the potential and kinetic energy of space cargo into electrical energy.

Table 1. The cost of geospace transportation in the first year of GPST operation.

Years since GPTS firs launch	Annual cargo transporatation, mln.t		Components of operationg costs per geocosmic cargo unit, USD/t					Self-costs per cargo unit, USD/t, (-)-means profit
	Lifting to Orbit	Landing on Earth	Lifting energy	Lost energy	Wages	Amortization	etc.	
1	100	10	429,55	190,91	90,91	55,2	7,5	774,06
2	200	50	315,00	168,00	40,00	55,2	7,5	585,70
3	300	100	262,50	157,50	25,00	55,2	7,5	507,70
4	400	150	238,64	152,73	18,18	55,2	7,5	472,25
5	500	200	225,00	150,00	14,29	55,2	7,5	451,99
6	500	250	175,00	140,00	13,33	55,2	7,5	391,03
7	400	300	75,00	120,00	14,29	55,2	7,5	271,99
8	300	350	- 40,38	113,08	15,38	55,2	7,5	150,78
9	200	400	- 175,00	140,00	16,67	55,2	7,5	44,37
10	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
11	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
12	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
13	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
14	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
15	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
16	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
17	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
18	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
19	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
20	100	500	- 350,00	175,00	16,67	55,2	7,5	- 95,63
total	4000	7310						

GPST with such incredibly high efficiency and performance characteristics is the tool of non-rocket space industrialization to prevent planetary ecological-resources catastrophe and to ensure the further technocratic development.

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