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ECOSPACE PROGRAM AS THE TRANSITION OF CIVILIZATION TO THE NATURAL PATH OF TECHNOCRATIC DEVELOPMENT

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ABSTRACT

The key goal of the EcoSpace program is to eliminate the harmful anthropogenic oppression of the Earth's biosphere by the technosphere. However, this will be possible only if there is an energy-efficient, environmentally friendly and safe geocosmic transport system that will be able to provide industrial-scale cargo and passenger transportation, which is millions of tons of cargo and millions of passengers per year, while reducing the cost of transportation compared to rockets by at least a thousand times. Thus, the implementation of the EcoSpace program: "The Earth - for Life. Space - for Industry." is possible only if there is a general planetary vehicle (GPV).

Keywords: GENERAL PLANETARY VEHICLE (GPV), GEOCOSMIC TRANSPORT SYSTEM, USPACE, ORBIT SPACE INDUSTRIAL NECKLACE (SIN ORBIT)

INTRODUCTION

Man chose the technological path of civilizational development about 2 million years ago, when he created his first engineering technologies, including lighting the first bonfire and cooking food on a bonfire. Primitive people died of lung cancer at the age of 20, until they guessed to take fire and other simple industrial technologies out of the cave, their home, into the environment – into the big biosphere house Earth. Today we fully feel the result of the subsequent technological development and the creation of a global industry (technosphere) – the biosphere of our planet is filled with technological smog, threatening not only man, but all life on Earth.
The total energy efficiency of a carrier-rocket running on solid or liquid fuel is about 1%. Geocosmic transportation by means of rockets will always remain extremely dangerous from the point of view of ecology, and their cost will exceed 1 million USD for each ton of cargo delivered to space (or back). And, most importantly, the ozone layer that protects our planet from harsh cosmic radiation (ultraviolet) is destroyed in colossal volumes – millions of tons per each launch of a heavy rocket.

It is a common knowledge that ozone is produced from the air, being passed through an ozonizer. Cost of the ozone production depends on the electricity prices, as this process has high-energy consumption. The best industrial ozonizers consume about 10 kWh of energy to produce 1 kg of ozone [1]. With an average world cost of electricity of about 0.1 USD/kWh, the cost of electricity consumed to obtain 1 ton of ozone will be approximately 1,000 USD in energy. Considering the cost of equipment and the overheads, the cost will be significantly higher for the largescale application.
The EcoSpace program proposes the most efficient approach to solving this problem by combining private, public and government initiatives. The program is based on the synthesis of the cosmic worldview and specific astroengineering technologies implemented in the foreseeable future.

The geocosmic transport system optimal for the industrialization of space must meet the fundamental laws of nature. These include four physical conservation laws: energy, momentum, angular momentum and the motion of the center of mass of the system. At the same time, the design and principle of operation of the cosmic transportation system should be integrated into the environment with a minimal impact on the biosphere, harmoniously fit into the landscape and not contradict the ongoing natural processes. To date, only one engineering solution meets the specified conditions and meets a number of additional geocosmic transport and logistics requirements subject to the tasks of space industrialization – this is a general planetary vehicle (GPV) developed by engineer Anatoli Unitsky.

MODELING AND METHODOLOGY

To implement the EcoSpace program, the authors used the methods of deduction and analysis:

1.Preparatory stage.

Implementation period: 20-25 years (from 2020 to 2045).
Goals and objectives: conducting research, development and technological work (R&D), construction of an Equatorial Linear City (including an equatorial launch overpass), production of GPV, organizational preparation and logistics support of GPV flights.

2.Basic industrialization of space.
Implementation period: 10-15 years (from 2040 to 2055).
Goals and objectives: creation and rapid capacity expanding of the basic branches of the cosmic industry, which will allow the competitive displacement and smooth, industry by industry, reconstruction of the existing dirty technosphere of the Earth. In parallel, it is planned to carry out the installation of the transport and infrastructure part of the SIN Orbit, construction of the first residential and industrial orbital clusters using materials of terrestrial origin. Further, mass industrial development of equatorial orbits using space materials is envisaged.

3.Large-scale industrialization of space.
Indefinite, starting from 2055.
Goals and objectives: expanding the range of high-quality consumer and industrial cosmic goods and services, setting up a competitive geocosmic market.
This article discusses the model of a general planetary vehicle (GPV), a constructive version of which is shown in Fig. 1 using finite element analysis, which is a modern advanced technique for calculating all possible structures and processes occurring in them. The essence of the finite element calculation is that the model or process is discretized by elements or by time, respectively and the results are on Fig.4.

RESULTS AND DISCUSSION

A general planetary vehicle is an eco-oriented reusable geospace transport that allows exploration of near space without the use of rockets. It is presented in a form of a self-supporting aircraft (Fig. 1), covering the planet within the equatorial plane [2].
The uniqueness of the GPV operation is seen in the way of reaching the outer space. It happens by the increasing in the diameter of the ring (by 1.57 % when lifting every 100 km) and reaching at the calculated altitude (with passengers and cargo) the peripheral velocity of the body, which should be equal to the first cosmic velocity up to 10−12 km/s. The GPV has a glow of a hybrid magnetic suspension of flywheels (Fig. 1). The design includes a system of power limiting magnets, a system of stabilizing emissions and a linear electric motor, the issuance of acceleration of flywheels, as well as power take-off in the process of admitting GPV. At the same time, the position of the centre of mass of the GPV does not change in the elevation process and it always coincides with the centre of mass of the planet. The resulting force acting on the rotor from the side of the magnetic system is determined, provided that there are no external influences, except for gravity, it is equal to 30 N and is directed from the center of mass of the earth.
Therefore, the movement (rising to altitude and receiving the first cosmic velocity at a given altitude) can be carried out relying on the internal forces of the system, without significant interaction with the environment.

Fig.1 – GPV design: 1.1 and 1.2 – belt flywheels;
2.1 and 2.2 – magnetic suspension systems and linear electric motor;
3 – body; 4.1 and 4.2 – containers with cargo (visualisation)

The mode of ascent and docking in orbit sets so that at any operating speed the GPV takes place to turn off the speed, takes place stabilizable and is determined in acute (stretched) equilibrium. When delivering a cargo mass m_c to a circular orbit r with direction R from the center of the Earth, work A [3] is performed to as Eq. (1):

$$A = \frac{\mu_3 m_c}{R}\left(1 - \frac{R}{2r}\right), \qquad (1)$$

here μ_3 -is the gravitational parameter of the Earth.
To do this, the body near the surface of the Earth must have a characteristic velocity *Vx* to as Eq:

$$V_x^2 = \frac{2\mu_3}{R}\left(1-\frac{R}{2r}\right) = V_2^2\left(1-\frac{R}{2r}\right), \tag{2}$$

V_2^2 is the second cosmic velocity.
The total energy E_n, which should be spent to bring the body into space to as Eq. (3):

$$E_n = \frac{A_n}{\eta_E} = \frac{K_g}{\eta_E} = \frac{m_c V_x^2}{2\eta_E} = \frac{m_c\mu_3}{\eta R}\left(1-\frac{R}{2r}\right), \tag{3}$$

here ηE is the energy efficiency of the GPV, taking into account all pre-flight and flight energy losses; Kg is the kinetic energy of a body with a speed Vx. The total power N developed by the GPV during the launch of cargoes into orbit to as Eq. (4):

$$N_n = \frac{E_n}{t} = \frac{m_c\mu_3}{\eta R t}\left(1-\frac{R}{2r}\right) = \frac{m_c V_2^2}{\eta t}\left(1-\frac{R}{2r}\right), \tag{4}$$

here t is the operating time of the GPV (the time of supplying energy to the load). On Fig.2 and Fig.3 show the energy consumption and the power of the GPV when launching a cargo into orbit [3].

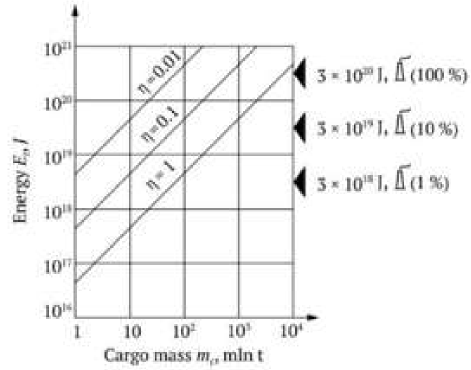

Fig.2. Energy consumption required to take cargo to the orbit, Vx = 104 m/s

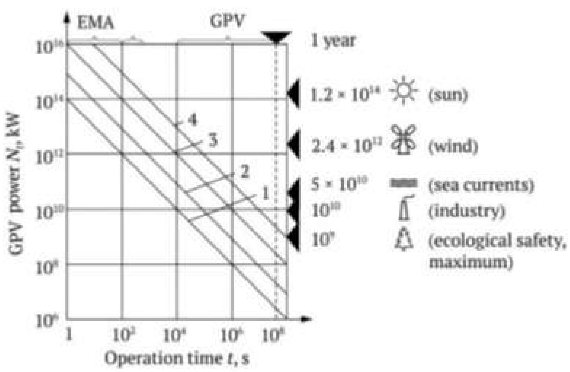

Fig.3. GPV generated during taking cargo to the orbit at Vx = 10 ^{4} m/s η= 0.5 and mc equals:
1-1 mln t; 2- 10mln t; 3 – 100 mln t; 4 – 1bln t.

The specific load capacity of the system is 12,330 N/m or 1,257 kgf/m. With the specific mass of flywheels and shell equal to 250, 225 and 200 kg/m, respectively, the maximum payload mass was 582 kg/m. The actual load capacity is 500 kg/m.

We have made calculations on the impact of forces acting on the GPV during takeoff. The results are presented in Fig. 4

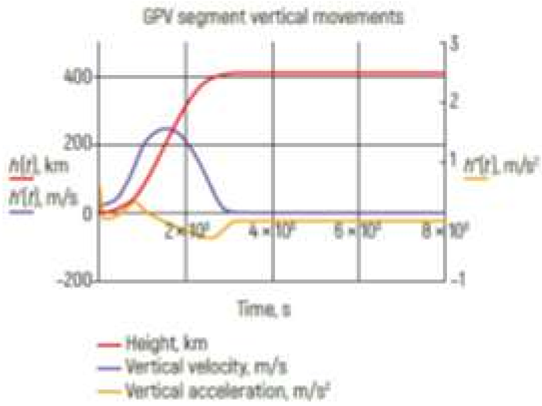

Fig.4 – Diagram of abscend, vertical velocity and vertical acceleration with time

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