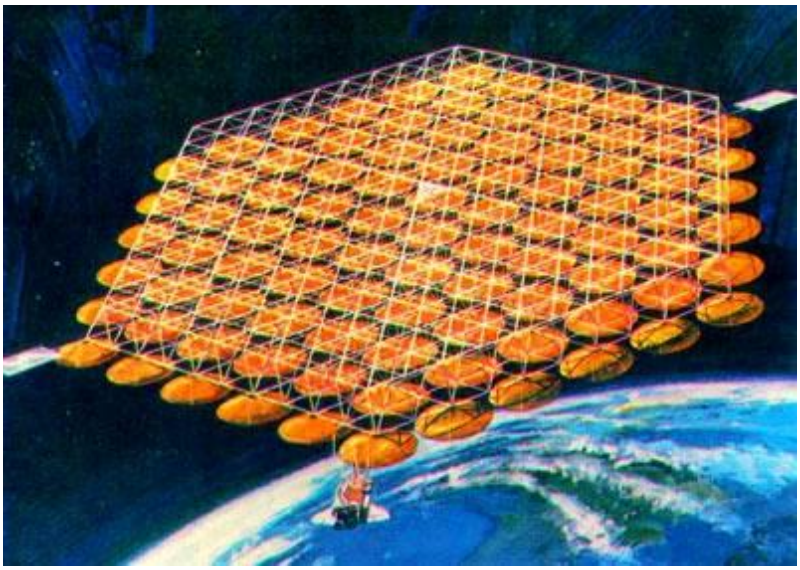

Project Helioplane, an inexpensive component of space power plants and transport systems of the future.

The project is a qualitatively new spacecraft capable of going into orbit without rockets and working as a component of space solar power plants. The device "Geleoplan" is a light, inflatable, structure similar to a dirigible. Able to concentrate the sunlight by its bottom, which is a hemispherical concave mirror, into powerful light rays. Serving as an energy source, both for special engines with external power supply, and for special solar batteries capable of operating at high temperatures.

Due to the ability to go into orbit without rockets, due to its own engines, helioplanes greatly simplify the task of developing mass, space, solar, energy.

After the appearance of the first power stations in space, transmitting energy to the earth in the form of narrowly directed beams, laser or microwave, new modifications of helioplanes can be launched inside these beams. Working from a radiation source many times greater than solar. And therefore, more powerful and economical, capable of delivering into space not only their own weight, but also a significant mass of payloads. Helioplanes taking off from the ground due to the energy of the rays of solar power plants. They will serve as qualitatively new means of space, transport and energy infrastructure. Facilitating the task and development of space solar energy, and the development of low-cost transport links between earth and space.

Helioplanes can also be used as reusable transport ships on planets with low gravity. Such as the Moon, Mercury, or small planets in the asteroid belt.

In the future, helioplanes can serve as components of a qualitatively new space infrastructure of transport and energy, giving new opportunities for industrial colonization of space.

Prospects and possibilities of industrial space exploration.

The colonization of space and the transition to the cosmic level, one of the most important tasks facing human civilization. Modern private firms are looking at the practical exploration of space with interest. There are innumerable resources in space and a wide range of activities. The first firms that will begin the industrialization of space will gain access to a new market, in which there are no competitors, no resource shortages, and no other constraining factors.

There are many attractive prospects in space, but there are also many strong obstacles hindering the development of large commercial projects. The main deterrent barriers to the industrialization of space are the excessively high price of modern space transport. The lack of technology that can work effectively in space conditions. And a weak organization that hinders the consolidation of industrial research capacity and capital for the development of large projects.

To reduce the price of space transport, you can, if you move to a qualitatively new transport system. Having low price and high performance. Famous examples of the future space transport infrastructure are reusable chemical-fuel rockets, space elevators, orbital slings, orbital tugs with electro-jet engines, or powerful electromagnetic guns.

To overcome the technological gap between the modern earth industry and the future space industry, it is possible, if you make projects based on available technologies. So that they immediately begin to work, make a profit and go to growth. And then, as it grows, it will lead to high-quality technological modernization. By investing in the improvement of technology, the money received from the profits, so that there is no threat of long-term “Hang-ups” at the research and development stage.

It is possible to overcome organizational dissociation through the interaction of generators of ideas and enthusiasts with industry and capital. Without the mediation of the state space administrations, these structures are ossified and built under the task of space exploration, they are not suitable for its practical industrialization. Create a basis for the development of the space industry can groups consisting of project developers, industrial firms, research laboratories and banks. But such groups must first be created by someone.

The mission of the coordination center for the preparation for the colonization of space takes on the organization «DarkStar Aerospace».

DarkStar Aerospace is a scientific and public organization that supports various initiatives aimed at space exploration. And recently she decided to change the format of her work. Go with a simple support for the active development of initiatives aimed at preparing for the colonization of space on earth and the practical industrialization of the solar system.

Based on the organization DarkStar Aerospace will develop a focal point that forms and supports the community of creatures, entrepreneurs, public figures and enthusiasts. With the goals of developing strategic plans for the industrial development of the solar system. Support teams and private companies developing projects in the field of practical space exploration. Formation of financial and industrial groups capable of implementing plans for large-scale industrialization of space in practice. As well as the development on earth of entrepreneurial communities working on technologies and principles of the future space industry. And the development of social movements contributing to the popularization of space expansion and the lifestyle of the "People of the space age." With the goal of creating an industrial, economic and social foundation on earth for the future colonization of space.

I am a non-system innovator, a supporter of the development of space expansion, “Nikolay Agapov”. I entered the DarkStar Aerospace focal point at the stage of its formation. And I have organizational and technical projects that can facilitate the task of industrializing space.

Helioplane, a promising component of space transportation and energy systems.

One of the technical projects is a project of a qualitatively new transport energy infrastructure. Consisting of specialized, spacecraft, combining the properties of rockets and orbital solar generators. Able to take off to a high, “Geostationary”, orbit, on which the rotational speed of the satellites and the earth is the same, so the devices hang motionless relative to the earth's surface. From a stationary orbit it is easier to transfer energy to the earth in the form of a laser or microwave beam, due to the fact that the satellites are stationary relative to the earth.

Helioplanes should take off without using traditional rockets. Due to its own engines. And after going into orbit, should work as solar generators. Transforming sunlight into narrow radiation, for transmitting it to terrestrial receivers. Combining many helicopters in large clusters, you can build powerful orbital power plants.

On the device, Helioplanes are inflatable hemispherical mirrors made of plastic film, concentrating sunlight into narrow, powerful rays. Rays of high-energy light, which give “Film, solar, concentrators”, can power a jet engine with an external energy supply, consuming hydrogen as a working medium. And after the device reaches the desired orbit, the stream of concentrated light in a less focused state should be redirected to thermal generators, or heat-resistant photocells.

An apparatus of this type is a machine operating at the expense of the sun’s energy and capable of independent flight; I called it “Concentrator, Space, Helioplane”, or “Agapov's Helioplane”.

The device and the possibility of the helioplan.

Helioplane, a car that looks like a dirigible. It is an inflatable body shaped like an egg, turned upwards with a sharp end. The sheath of the helioplan consists of an ultrathin and light, but strong, plastic film consisting of polymers of comparable strength to Kevlar.

The lower part of the shell has a mirror coating on the inside. And it is a hemispherical solar concentrator operating as a concave mirror. The remaining shell of the heliplan is transparent to light. Sunlight falling from above to the bottom of the apparatus, which is a concave, film-like mirror, is concentrated in a narrow beam falling on the top of the apparatus. From where it is reflected by the mirror, in the center of the lower part, it passes additional concentration and enters the engine.

Helioplane engines are similar in structure to nuclear jet engines, only the fuel entering them, the working fluid, is heated not by a nuclear reactor, but by sunlight. Concentrated sunlight passes into the engine from above, through the transparent upper hatch. And it falls on black, multi-layered carbon fiber grids, or carbon-carbon composite (Composite of carbon cloth and graphite). Actively absorbing sunlight in the heat, but freely passing a stream of gas - the working fluid.

Passing through the lattice, the gas should be heated to a high temperature, comparable to the burning temperature of rocket fuel, 1.5 - 3 thousand degrees. After that, go through the nozzle at the bottom of the engine, creating a jet thrust.

Thermal, jet engines of the helioplan, working on hydrogen, are much more efficient than engines of traditional rockets on chemical fuel. To launch into a geostationary orbit, a traditional rocket needs to burn fuel, by weight, about 100 times the payload. Solar-thermal engine on hydrogen, to enter a stationary orbit must consume hydrogen, about 5 - 15 times the weight of the device. That is, it does not need a rocket consisting of several stages. To reach the working orbit, it only needs a few tanks with liquid hydrogen. The weight of the fuel tanks, at the same time, will only be 5 to 15 times the weight of the helioplan.

To facilitate the work of the solar, thermal engine, in the early stages of flight, when the helioplan is loaded with fuel out of the string, it is possible to use oxygen supply to the engine. In such a way that partial combustion of hydrogen adds 50 to 70% of thrust, performing the role of an afterburner, or starting accelerator. But at the same time, oxygen tanks did not overload the device. After exhaustion of oxygen in the first minutes of flight, oxygen tanks should be dumped. And further, the helicopter should continue to fly on solar energy.

In order for a geleoplan to go from a geotransfer orbit to a geostationary one, the engines of the apparatus must give an impulse to the side, without losing their orientation towards the sun. For these purposes, a rotary nozzle of the main engine with a variable thrust direction can be used. And a small, auxiliary engine on the side of the device, providing centering and control during side flight. In the auxiliary, side, engine, concentrated sunlight should come from a

separate mirror, cutting off part of the light from the main stream, in the center of the helioplan.

It is impossible to maintain the tightness of the inflatable hull of the geleoplanes in open space for a long time. Because of the meteor dust that will pierce their shells. It is possible to maintain the shells of the helioplanes in the inflated state due to the electric fields. Filling the inner space of the helioplan with microscopic glass beads, smaller in size than the photons of light. Having received an electric charge, the balls will repel each other, and in weightlessness they will line up in a kind of crystal lattice. In an electrically charged helioplane, the balls will maintain low pressure inside its envelope. But they will not be able to fly into holes from meteors, like gas molecules. Due to the fact that they will not have high speed, and will be repelled from the film walls, regardless of the presence of small holes in them.

After the release of geleoplanes to a stationary orbit, they should go into the mode of solar generators. And to unite in the assembly, consisting of hundreds, or thousands of individual devices. To make it easier to keep them in orbit. And maintain an accurate orientation of the sun, due to the high mass and inertia of the assemblies. Helioplane assemblies in stationary orbit will be small solar power plants. Which, in turn, can be combined into larger assemblies or clusters, by total generation, reaching industrial, gigawatt capacities.

To convert sunlight into electrical energy, special photocells must be used. Having the form of a thin and light film, and capable of operating at high temperatures. The solar cell should be located at the top of the helioplan. In place of a mirror reflecting light, concentrated by the mirror, concave bottom of the helioplan, in the lower part of the vehicle, to the engine. The upper, intermediate, mirror, should be a film solar panel, covered with a thin mirror film in the form of petals. After the helicoplan has entered a stationary orbit, the petals of the intermediate mirror should be turned 90 degrees. To the light fell on the solar panel. And the device began to work as a solar generator.

To convert electrical energy into radiation directed to terrestrial generators, either thin wire antennas emitting microwave beams should be used. Or, light, flat, semiconductor lasers.

It is also possible to operate the engine in the solar-pumped gas laser mode. Directly converts concentrated sunlight into a laser beam. But now, the development of such a laser is too difficult. Modern solar-pumped lasers have too low efficiency.

Helioplan of the first generation, may have a size of about 120 meters in diameter, and weight, without fuel, about 100 - 200 kilograms. This weight and size is close to optimal. If you make vehicles heavier, they will be too heavy to fly due to the energy of the sun. If it is easier to do, they will be too expensive and difficult to manufacture in terms of the weight and power of the generated energy. The cost of scientific work invested in high-tech products does not depend much on their size, therefore, the larger their size, the lower the relative price.

Using the energy of solar power plants to power engines of high-power solar helioplanes.

After creating in geostationary orbit the first clusters of helioplanes generating powerful, narrowly directed rays. These rays can be used to illuminate the helioplane starting from the ground. Laser, or microwave, rays emanating from the height of the geostationary orbit will produce a spot on the earth, the diameter of which will be from a few hundred meters to several kilometers. By creating a stream of radiation that can be many times greater than the solar intensity.

The beam emanating from the orbital generating platforms on the ground must fall on the generators, and be converted into electric current. But it can also serve as an energy source for vehicles operating on the helioplan principle.

If you start vehicles with jet engines operating from radiation, in a beam emanating from orbital power plants, this will greatly increase their power and give them new opportunities. Helioplanes designed for take-off in the beam of orbital power plants, Laser Helioplanes, or Microwave Helioplanes, will operate from a much more powerful source of energy than the sun. And besides, a focused beam is much easier to concentrate, receiving radiation fluxs of many times higher concentration than is possible for sunlight.

A radiation source that is powerful and convenient for concentrators will make it possible to design new modifications of the helioplan. With such advantages as:

The ability to design devices of many times larger size and weight, which will reduce their cost.

The ability to make solar panels from less durable, but cheaper materials, which also reduces their cost.

The ability to use plasma engines with an external energy supply, in the form of laser or microwave radiation of high concentration. In plasma engines, the working fluid is isolated from the internal walls of the engine, so that the temperature of the working fluid can reach 5 thousand degrees or more. The temperature of hydrogen in a plasma engine will be approximately twice as high as in a solar thermal one. At this temperature, the hydrogen will decompose into atoms, which will reduce its molecular weight by half and, accordingly, increase the flow rate. Therefore, plasma engines operating from narrowly directed radiation will be much more economical than simple solar thermal engines.

Ability to carry a significant payload. Unlike solar helioplanes, the power of which does not allow to carry additional cargo on board. Helioplanes on laser or microwave illumination, due to the high power and efficiency of engines, can be used as inexpensive and effective means of cargo delivery into orbit. What will make them a qualitatively new, mass, means of space transport.

Helioplanes as space shuttles for low gravity planets.

Helioplane, can be used as reusable means of launching into space, space shuttles. For low gravity planets such as the Moon, Mercury, or small planets in the asteroid belt. Low gravity and low orbital speed will enable the helicopters to take on a significant payload. And the ability to make flights from a planet to orbit and back. Or from orbit to the planet and back, on one refueling.

Such helioplanes - shuttles, can use as a fuel hydrogen derived from water. Or even water obtained from ice. But the helioplanes working on water, greatly reduce the load capacity and increase fuel consumption. As a working fluid for transport helioplanes, it is also possible to use liquid oxygen, which can be obtained from the soil, regardless of water sources. But on oxygen, helioplans will have the lowest efficiency.

The possibilities of creating and the benefits of using helioplans.

At the level of modern technology, the creation of helioplanes is quite a difficult task. Now for the creation of such machines is not enough of many technologies and technological traditions. But on the other hand, the technological gap facing the mass production of helioplanes is not critical. There is no need to do something completely new or super-complicated or super-expensive. The technologies necessary for the production of helioplans are now in their infancy, you just need to bring them to a high level, make them massive and cheap.

The development of the first serial helioplans is a difficult task, but this is not a mega project. To begin the production of helioplans, can and small private teams, with a budget of tens of millions of dollars. For comparison, the development of a new serial missile costs billions of dollars.

The development of the first serial helioplanes will provide an opportunity to begin the construction of orbital power plants with low infrastructure costs.

Solar energy is one of the main resources of outer space. The energy of the sun is pure and inexhaustible, in space, it does not depend on the time of day and weather conditions. To build industrial, solar power plants in space is expensive. But on the other hand, in space conditions, in the absence of gravity and the atmosphere, the lightest and cheapest materials can be used to concentrate sunlight. Mirror plastic film, one hundredth micron thick, which weighs almost nothing and costs little.

It is possible to convert sunlight into electricity by film photocells of micron thickness, the weight of which is also small. The concept of helioplanes, for the construction of orbital power plants, takes full advantage of the advantages of film structures. These devices consist of ultra-thin film, have a minimum weight and are able to independently take off into a geostationary orbit. Allowing to start the construction of space energy infrastructure without having at the same time cheap and mass, space, transport infrastructure.

For the construction of orbital solar power plants from solar helicopter assemblies, expensive infrastructure transport systems, such as orbital sling, or electromagnetic guns, are not needed. No need to increase the production of traditional rockets on chemical fuels.

Although chemical rockets may be needed to launch the first helioplan. Helioplane easier to run outside the atmosphere. Therefore, probably, the first cars will start from the “Suborbital Jump”, from a height of about 100 kilometers. For the withdrawal of helioplanes in a suborbital

flight, special chemical rockets will be needed. But suborbital rockets are simple and do not consume a lot of fuel. Their task is not to accelerate the load to orbital speed, 8 kilometers per second, but to toss the load to a height of about 100 kilometers, for which the fuel needs 20 times less. With a high probability, these will be multi-unit, single-stage rockets with pressure fuel delivery. Such rockets are easy to manufacture, cheap, and require little maintenance between flights.

Over time, helioplan technology will be developed, and machines capable of rising into the upper layers of the atmosphere will be developed independently, like airships. And start from a height of 40 - 50 kilometers.

After the creation in orbit of the first powerful power plants that can generate rays exceeding the power of solar radiation from the earth. Launching new helioplans will be much easier. Helioplanes taking off along the beam will be more powerful, cheaper, more economical. And they will be able to take over the functions of a massive, inexpensive means of delivering goods to orbit. Working as a component of a new generation of space transport infrastructure.

Helioplanes, one of the cheapest and most accessible in implementation, projects of space infrastructure, energy and transport. Medium or large firms can start production of helioplans. Or a start-up team with sufficient qualifications and funding.

Together with the start of serial production of helioplanes , the cost of energy of space power plants based on helioplanes will decrease significantly.

If the cost of cosmic solar energy becomes lower than the energy of thermal power plants, the mass construction of power plants in orbit will begin. Investments in the hundreds of billions and trillions of dollars will flow into space.

Large construction projects in space will stimulate the development of other areas of industrial activity outside the land. Such as, maintenance, production, development of a fleet of orbital tugs, development of orbital industrial centers based on manned stations, extraction of extraterrestrial raw materials, construction of bases on the Moon and asteroids.

Terrestrial precursors of space helioplanes.

Before embarking on the development of space helioplanes, it is logical to launch into production their simplified terrestrial counterparts, designed for work in the atmosphere, “Atmospheric helioplanes”.

Atmospheric helioplanes are airships consisting of plastic film, capable of generating electricity, and moving independently due to solar energy. They will be able to work as transport airships with unlimited flight range. Or air, solar power plants that can move independently. Flying solar power plants are convenient because they can move independently from production sites to customers. They can be located almost anywhere, and can easily change their location, regardless of land transport infrastructure.

The projects of atmospheric helioplanes are much easier to implement than space projects. But they will contribute to the development of technology, the development of industrial capacity, which later can be directed to the industrialization of space. Will contribute to the consolidation of intelligence and capital, which will later work in space projects.

Project helioplan in the coordination center DarkStar Aerospace.

The tasks of the DarkStar Aerospace focal point are to prepare for the beginning of the colonization of space on earth and to develop projects that contribute to the industrialization of the solar system.

The project is well suited to the objectives of the center of the DarkStar Aerospace. Since this is a component of a qualitatively new space, transport, energy, infrastructure, it is relatively simple and cheap to implement.

Helioplane, one of the projects to be developed as part of the coordination center.

The main stages of the project development are:

Popularization of the concept, its capabilities and prospects.

Creating an intellectual community working on the project. His detailed theoretical study.

Development of terrestrial, atmospheric helioplan projects. Creating atmospheric helioplanes does not require inaccessible or expensive technologies. But earth projects can contribute to the development of solar energy, the development of communities of intellectuals and entrepreneurs, the accumulation of industrial facilities and financial resources, which later will be able to work in space projects.

The project of the helioplan is still at the concept stage. Team to work on the project is not formed. And all who are interested in it can join the project.

Nikolay Agapov.

The first publication in the Russian popular science site «GlobalScience.ru»:
http://globalscience.ru/article/read/28151/