YUZHNOYE SDO: POTENTIAL JOINT BUSINESS ACTIVITIES, TAKING INTO CONSIDERATION THE CURRENT TRENDS OF SPACE INDUSTRY PROGRESS

YUZHNOYE

Humanity has at least ten reasons to explore space:

1. Technology development.

2. Scientific discoveries, made through space research, enable to enrich our knowledge about the Universe nature and promote the fundamental sciences.

3. Space may help humanity to solve power problems

4. Space industry provides with job hundreds of thousands of people in many countries.

5. Space tourism directly emanates from space program development.

6. Space is closely related to defense technology, which enable countries to ensure its security.

7. Only having powerful space technologies it is possible to ensure planet protection from asteroids like those which eliminated dinosaurs 70 million years ago.

8. Bases on the Moon and Mars creation.

9. Space is of a huge political importance, success in outer space exploration improves the credibility of the country.

10. Space is the global aim which may consolidate, with the course of time, the whole humanity.

It is for this reason space industry is being the most actively developed industry of the world economy. Annual turnover of the world space industry makes up about $170 billion.

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Ukraine is one of ten countries of the World, possessing space industry, which involves almost 30 enterprises, design organizations and research institutes.

For active participation in international programs on outer space research and exploration, Ukrainian space industry, as of today, possesses the required level of scientific and technical designs and adopted manufacturing technologies for such space-rocketry products as:

- Launch Vehicles (existing and prospective);
- Spacecraft (existing and prospective);
- Different type Liquid and Solid Rocket Engines;
- Launch Vehicles Control Systems and Telemetry Measurement Systems;
- Launch Vehicles and Spacecraft Units and Assemblies;
- Ground Complex Systems and Units.

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Yuzhnoye State Design Office named after M.K.Yangel was founded in 1954 to initiate development of strategic-purpose missile-weapon complexes.

More than 50 years of collaboration with PA Yuzhny Machine-Building Plant, academic, science and research, manufacturing enterprises of former Soviet Union resulted in the development and production of four generations of strategic missiles, represented by 13 modifications which formed the basis of strategic missile forces. There were also produced 7 types of world-class launch vehicles (Kosmos, Interkosmos, Cyclone-2, Cyclone-3, Zenit-2, Zenit-3SL, Dnepr) more than 40 types of different purposes liquid and solid rocket engines and ejected about 400 spacecraft of 70 types.

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Nowadays, when practical implementation of space policy is made through megaprojects, Yuzhnoye SDO is open for cooperation both within current and within perspective projects


YUZHNOYE
Interball
Science
Lybid
Lybid M
New Spacecraft
Yuzhnoye continues to develop different purpose spacecraft including Earth remote sensing, communication, scientific, etc.
By combination of high technologies with staff experience Yuzhnoye succeeded in achieving high performance capabilities and very high reliability of its spacecraft while holding relatively low price.
Additional benefits for customers are:
· Space technologies access
· Training of customer's staff
· Availability of integrated launch services
Space Patrol
Communications
MS-2-8
Sich-2 Optical
Sich-3 Radar
Mikron
Remote sensing
Sich-1M
Yuzhnoye SDO property

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RD-860

RD-8

AUOS-Z spacecraft
gas jet propulsion system

Okean-0
spacecraft thruster

Sich-2 spacecraft
ammonia thruster

- 11 types of main liquid-propellant engines with thrust level from 500 kg to 48,000 kg
- 6 types of liquid-propellant control rocket engines with thrust level from 5,000 kg to 29,000 kg
- 16 types of liquid, gas jet and electrical jet spacecraft propulsion systems with thrust level from 0.005 kg to 10 kg
- 7 types of main solid-propellant rocket motors with thrust level from 150,000 kg to 300,000 kg
- more than 100 types of special purpose solid-propellant rocket motors, pressure accumulators and gas generators
- 8 types of electric power units to provide hydraulic power to steering systems

were developed

15D339

15D171

Rocket Engines

RD-862

RD-861G

15U78

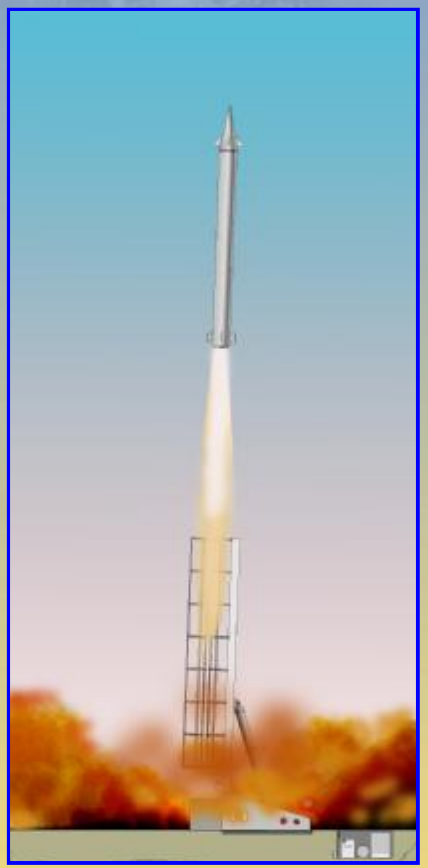
15D305

15D284

SOUNDING ROCKET SYSTEM

Developed for conducting of meteorological research or ecological monitoring of near-Earth environment at altitudes that exclude application of satellites, aircraft and balloons.

The system is developed in accordance with MTCR requirements.



System objectives and tasks are the following :

- delivery of the research equipment ~100 kg to the attitude ~100 km;
- recovery of payload using parachute system, soft landing system and equipment for reliable search after landing;
- the possibility of launches at wind velocity up to 25 m/s;
- minimum time of rocket preparation for launch at launch site is 0.5...1 h

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Advanced Materials and Technology

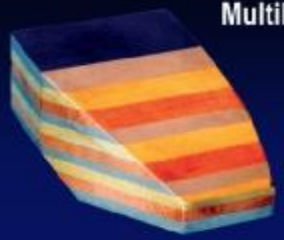
Wind power generator blades and mine structures made of fiberglass plastic

Non-metallic composites

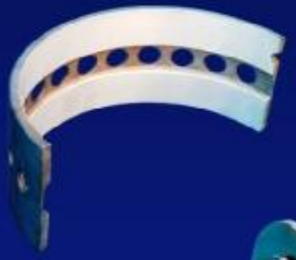
Metal Composites

are produsedby explosion welding

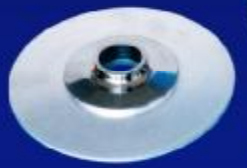
Multilayer composites



Heat exchangers



Plain bearings



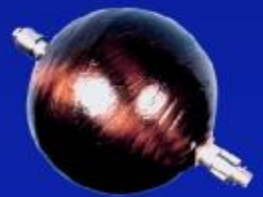
Bimetallic adapters

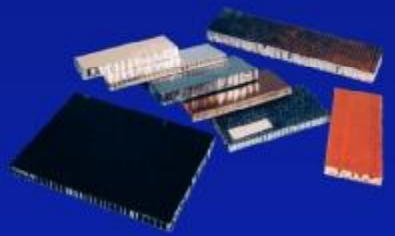
Solid rocket motor body of “cocoon” type

Nozzle inserts and bells made of carbon-carbon composite

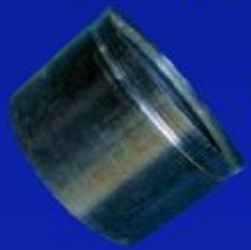
Metal-Plastic Composites

Metal plastic bottles





3-layer honeycomb structures



Launch vehicle aft sections and spacecraft trusses made of carbon fiber composite

Yuzhnoye SDO property

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SPACE CLIPPER

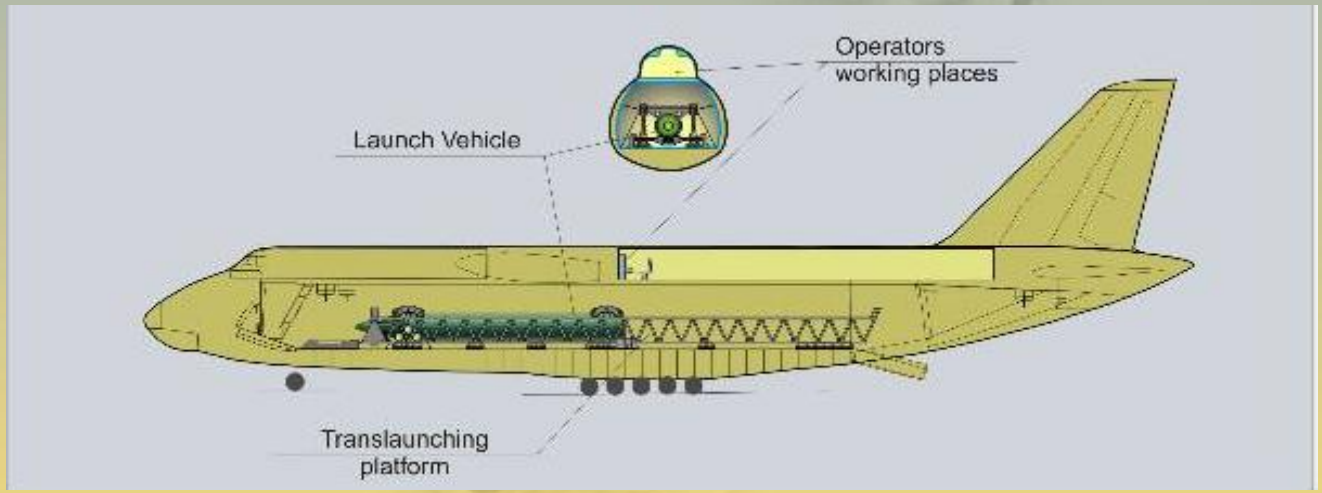
PURPOSE AND ESSENCE OF THE PROJECT

PURPOSE OF THE PROJECT:

The purpose of Space Clipper Project is ensuring of access to space that would not depend on geographical position of a country and would provide dedicated launch for growing number of spacecraft

ESSENCE OF THE PROJECT:

Utilization of heavy cargo aircraft which serves for dropping two/three-stage launch vehicle weighing 36-70 tons.
Aerospace Rocket Complex Space Clipper consists of:
- aviation complex (modified An-124-100 Ruslan aircraft, ground-support equipment);
- space rocket complex (two/three-stage launch vehicle, on-board launch complex, technical base)



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MICROSPACE

PURPOSE AND ESSENCE OF THE PROJECT

PURPOSE OF THE PROJECT:

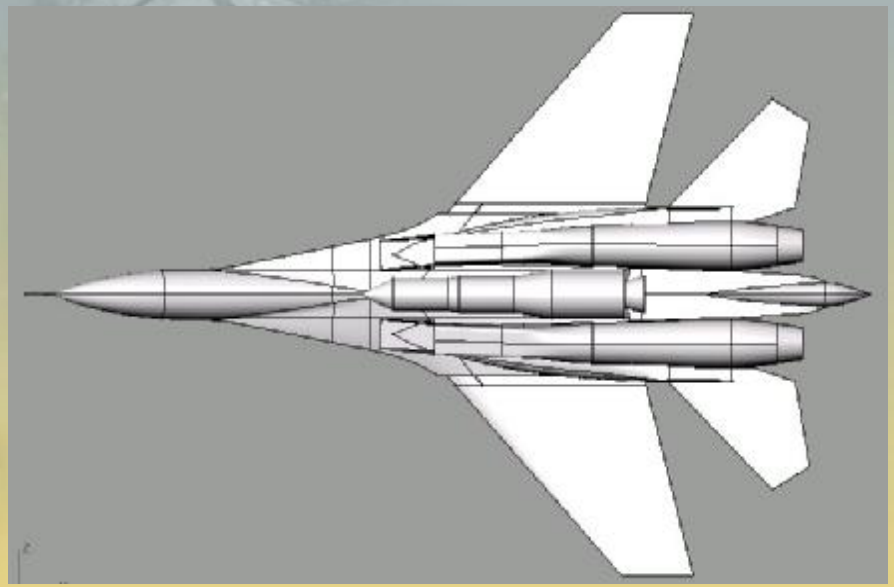
Nowadays there is a strong trend of miniaturization of space technologies, making various space missions achievable by mini and nano spacecraft which require dedicated launch, specific injection orbit parameters as well as launch time window. Moreover, a number of countries developing their own spacecraft have no possibility to perform launches from their territories. In order to pursue current trends and adapt to the geographic limitations Yuzhnoye SDO initiated conceptual studies of several ideas ensuring access to space that would not depend on geographical position of a country and would provide dedicated launch for growing number of mini and nano spacecraft.

ESSENCE OF THE PROJECT:

MICROSPACE Aerospace Rocket System is designed for the injection of microsatellites in a wide range of orbit altitudes (500-1000 km) and inclination (0° -98°) using supersonic aircraft.

MICROSPACE aerospace rocket system consists of:

1) three-stage LV;
2) aircraft-carrier SU-27;
3) production and operational complex.



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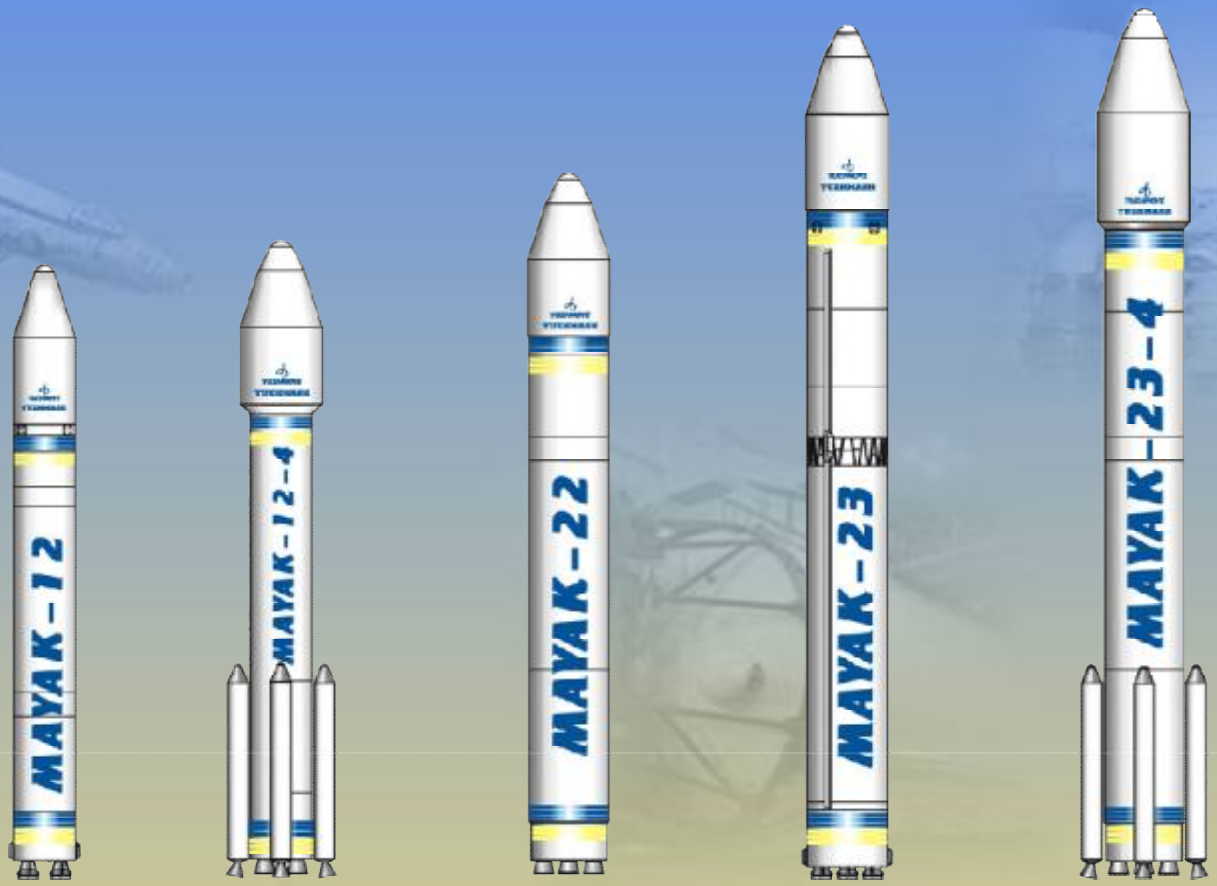
MAYAK LAUNCH VEHICLES FAMILY



Launch mass, t	130	185	250	320	375
# of stages/boosters	2/0	2/4	2/0	3/0	3/4
Payload mass, kg:					
H_{circ}=200km, i=50^0	2800	4500	6400	8800	11500
H=150/35860 km, i=2.1^0	-	1300	1800	3000	3800

Yuzhnoye SDO property

UNMANNED AERIAL VEHICLE

PURPOSES AND ESSENCE OF THE PROJECT

PURPOSES OF THE PROJECT:

Research & development, manufacturing and qualification tests of UAV equipped with a payload according to the tasks of the missions that was stipulated by a rapid development of UAV technologies worldwide as well as by the following advantages of UAVs:

1) Ensuring of humans' safety during the missions and excluding of the risk for the lives of personnel;
2) Quick reaction of UAVs to external factors comparing to the human's one, automatization of the process;
3) Opportunity to reduce the weight and size of UAV and to get an extra space for placement of payload and equipment due to the absence of a human inside the vehicle.

ESSENCE OF THE PROJECT:

UAV is designed for use in military and civil sectors with the purpose of implementation of reconnaissance missions. UAV has a possibility to perform the observations in visible and IR spectrums. Upon its comprehensive equipping it will be possible to conduct the autonomous missions aimed at receipt of the work area images that will enable to conduct the technical operations without the risk for the lives of personnel.

SPACE DISPOSAL OF HAZARDOUS WASTE

The analysis of the ecological situation involving the increasing amount of waste of the atomic power stations shows that the issue of the waste isolating becomes extremely urgent for mankind.

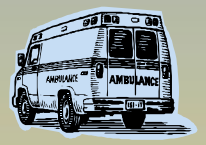
Isolation in space shall enable the globe to get rid of the long-lasting radioactive wastes forever unlike any other ways of burial on the planet.

At present there is a technical possibility to create a space rocket system for removing the highly radioactive waste into the remote space.

Weight of the annual radioactive waste of all the nuclear power stations of the country like e.g. Sweden or UK (10 GWatt), kg	714
Number of Zenit - 3 LV launches for removing of such amount of radioaktive waste	2

This Project is a unique response to the growing global need of safe and harmless utilization of the radioactive waste, providing a Potential Investor with a possibility to establish highly-efficient and stable business along with protection of the Earth from harmful waste .

SPACE PATROL PROJECT

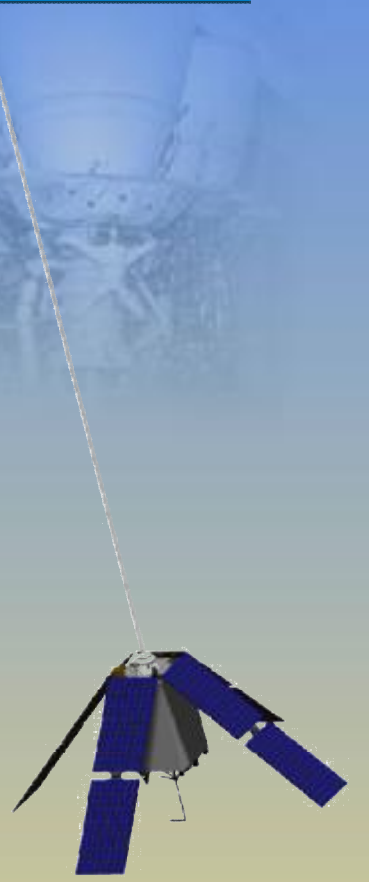


Ensuring of personal and social safety is the permanent task of humankind. Recently this problem has become crucial due to frequent terrorists' acts, local wars and revolts. This fact challenged the development of Space Patrol Project - a Global Satellite System of Crisis Situations Monitoring and Control.

The primary goals of this Project are: protection of human lives, assets, perilous and valuable objects, monitoring of man-caused accidents and natural disasters as well as solving tasks in the field of medicine.

Potential Customers:

- civil population;
- military and security services;
- personal transport;
- special transport for shipping special cargo;
- offices, villas, apartments, etc.;
- remotely controlled objects, etc.



The Project is a great opportunity for a Potential Investor to establish efficient business capable of serving various market niches requiring immediate response and efficiency for both military and civil purposes.

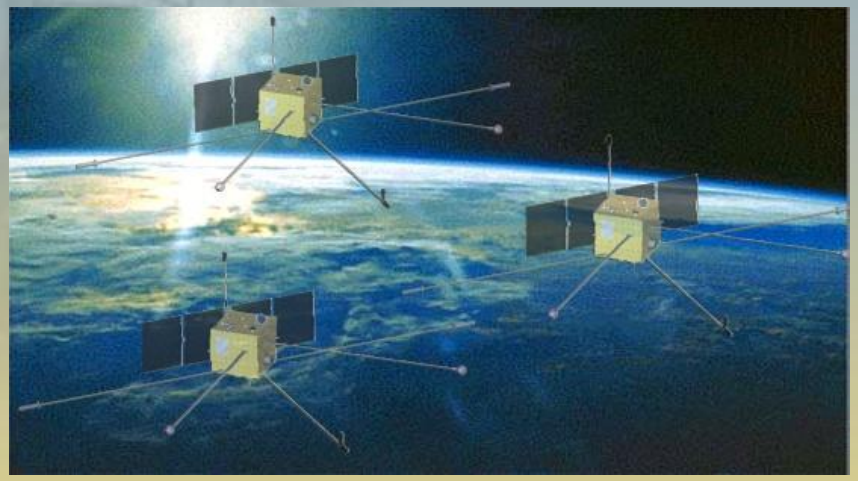
IONOSAT PROJECT

THE OBJECTIVE OF THE PROJECT: implementation of long-term space-time monitoring of main field and plasma parameters of ionosphere with the purpose of development of fundamental scientific concept of sun-earth interrelation physics, monitoring of current condition and forecasting space weather, diagnostics of natural and man-caused catastrophes by means of LEO Satellite Constellation consisting of 3 mini-satellites. Active life-time of the satellites is no less than 5 years. The altitude of a circular orbit is 600 – 700 kilometers.

The satellites under this project are developed based on space proven subsystems and engineering decisions that will allow to reduce costs for project development and creation of a multipurpose space platform for scientific experiments in low near-earth orbits.

The Ionosat main scientific equipment consists of the following devices:

- Inductive Magnetometer;
- Electrical Probe;
- Sensor of Cold Plasma;
- Ferroprobe Magnetometer;
- CCD camera of Visible and Infra-Red band with the Interference Spectral Drive;
- Data Acquisition and Storage System.



Participation in this Project provides Potential Investors with an access to the results of highly sophisticated scientific studies that may lead to creation of the System capable of predicting natural disasters, including the earthquakes.

YUZHNOYE SOLAR KEY – SPACE SOLAR ENERGY SYSTEM

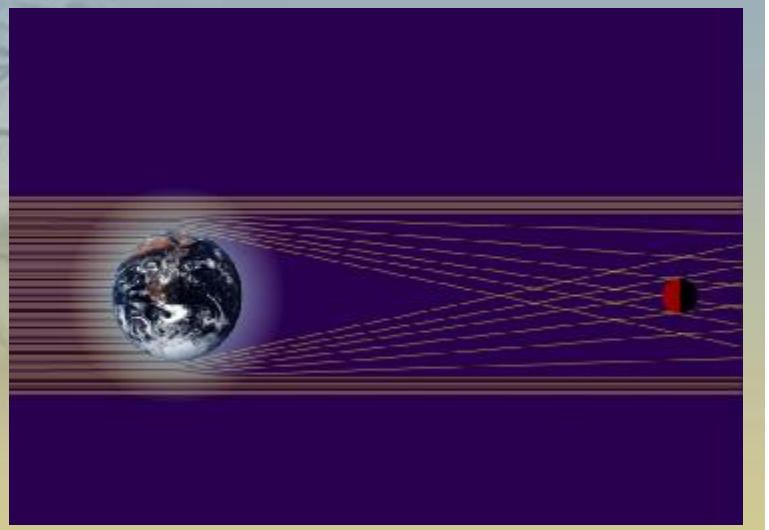
PURPOSES OF THE PROJECT:

The main purpose of Solar Key Project is generation of electric power from solar energy and its further transmission to the users on the Earth.

ESSENCE OF THE PROJECT:

The Earth's atmosphere possesses such a property as concentration of sunlight due to refraction of solar rays.

The Earth`s atmosphere acts on solar rays just as an optical lens acts: it concentrates them in a confined area in space at a distance from 450000 km to 1200000 km from the Earth. According to preliminary evaluation, concentration of solar energy in this area may reach from 200 to 2000 solar constants.

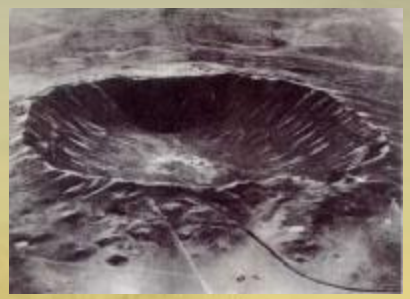


At the areas of high sunlight concentration there can be applied a number of reflecting spacecraft. The application of several spacecraft will make it possible to increase the power transmitted to the users.

ANTI-ASTEROID PROTECTION

Yuzhnoye SDO offers an effective and safe system of anti-asteroid protection that allows to eliminate or significantly reduce of a hazard of the Earth impact by large asteroids.

This system is designed to deflect an asteroid from a motion trajectory dangerous to the Earth . It can be applied at a distance of about 10 000 000 - 100 000 000 km from the Earth. The technical essence of the project consists in injection into interception trajectories of special modules flying at head-on courses. The specific feature of the proposed anti-asteroid modules is that they do not utilize the components of an atomic fuse applied in hydrogen bombs, and, therefore, no radioactive elements are present in the products of explosion. In the proposed system, initiation of the explosion reaction of hydrogen synthesis is provided at a meeting point of cumulative jets that are formed during collision with an asteroid at relative velocity of about 100 km/s. The anti-asteroid space-rocketry complexes, which realize the above described principle, can be developed already with the current level of technological evolution. The particular advantage of this system consists in the fact that it cannot be used for military applications within Earth environment, in particular by terrorists, which is especially important in to-day's world.



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YUZHNOYE SDO ALSO PROVIDES

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