CRITICAL ISSUES FORUM

SPACE: FORUM FOR COOPERATION OR NEXT FRONTIER FOR WMD PROLIFERATION

BENCHMARK III

The Author: Anastasia Bun'kova

Form 9B

Municipal Secondary School № 41

The Teacher-Advisor: Natalia Tolochko

The Teacher of English

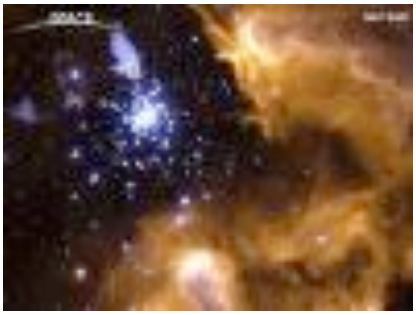
Municipal Secondary School № 41

Novouralsk

2007

CONTENT

In this benchmark I will determine the kinds of issues and problems that might arise in the development of space, and how these problems might be contained, controlled, or ameliorated.



I agree with the opinion of the astronomers who tell us that the universe, like a living organism, is constantly changing. From time to time, its gigantic masses of energy produce unparalleled explosions and disturbances, giving the impression that outer space are an arena of clashing passions and ambitions.

Something like that, but toned down by civilized ways, is taking place in astronautics. I can say that it has its own "disturbances" and its own small "explosions". Today, with new players emerging on the scene, it is futile to hope for peace and quiet in their relations. (9)

We know that 15 years ago everything was simple and straightforward. There were *two great space powers* which competed with varying degrees of success in the political, military and cosmic realms. But as I have learnt, the last few years have shown that two more participants are not only claiming a place in the sun, but are earnestly challenging the previous two. These new participants are, of course, *Europe and China.*

This raises the question: *Why do they want to pursue separate programs in near-Earth space?* There are no keen contradictions in politics and defense, say, between the *United States* and the *European Union*. Gone is the irreconcilability of *Russian, American and Chinese interests*. (2)

The point is that unlike in previous decades, astronautics has turned from something extraordinary and celestial into a down-to-earth aspect of everyday life. Present-day defense doctrines and an ordinary telephone call both depend on the degree of ***development of national astronautics or on the ability to hire space services.*** (6)

The leading world powers each prefer to implement their own programs for exploring and utilizing near-Earth and deep space. The more diversified a state's utilization of astronautics, the greater the economic dividends it ultimately gets by way of high-technology products and information. In moral and political terms, its international prestige is strengthened, and its citizens become more public-minded and confident in their government. (7)

These are the objective benefits. **Other possibilities for space powers** include

1. manned flights to near-Earth space,
2. distant interplanetary missions,
3. large satellite formations for military and civilian use,
4. all kinds of research projects,
5. a ramified ground infrastructure, etc.

In fact, it is the number of possibilities available that drives space relations nowadays. So *who are the declared players?*

Let us begin with the *East*. Specialists both in Europe and the U.S. estimate that a quarter of a million people work for the space effort in *China*, while the U.S., by its own admission, can afford only 75,000. Within the next few years China is going to bring the number of its working satellites to 100. It continues developing a heavy launch booster able to put up to 25 metric tons of payload into low orbits. In 2017, it is to launch a recoverable automatic lunar station, and ten years later the first Chinese astronaut will walk on the Moon. It appears China is determined to take advantage of all available opportunities. Will it succeed? It certainly will. With a feeling of pride from its own achievements multiplied by its specific national character and billions in investment, China, without looking right or left, will achieve all its ambitions.(12)

The U.S. operates almost 500 satellites and has a large fleet of carrier rockets with a matching ground infrastructure. Its budget for next year is $16.8 billion, and the idea of doing everything or nearly everything on their own does not appear far-fetched to them.

Can these powers fail to take some interest in each other as far as space is concerned? They cannot, of course. China, offended because the U.S. excluded it from the ISS project, is overtly trying to ignore American programs and developments. On the political level, some Congressmen have serious fears that China will soon overtake the U.S. in interplanetary research. (14)

This leaves us with two remaining players. The *Europeans*, like China, are angry with the U.S. for practically shutting them out of the ISS program. So *Europe's main objective* today is to put its own astronauts into space. The implementation of its own Galileo space navigation program is of great importance. The U.S. and China are wrapped up in their own problems and in no way view space cooperation as a tool for achieving their ends. The result is clear: Europe is already seeking cooperation with Russia. (5)

One more question, which I would like to ask, perhaps the last one for now: *Is this good or bad for Russia*? I doubt the advantages of international cooperation or the benefits of coordinating economic efforts. But still. What we see in Russia's space program does not always please us.

Despite increasingly generous financing for the industry, its resources are catastrophically short. This is one aspect of the matter. The other is an irresistible urge to pursue every available option. This is clearly impossible. There is also a growing temptation to borrow from the outside, which results in dependence on the giver. (13)

An example is the Kliper program, a seemingly successful project carried out by the Energia space and rocket corporation. Though it required only one billion dollars, the money was never found. The program was overhauled. Now we are modernizing the outdated Soyuz rocket, with the European Space Agency agreeing to furnish the money, though perhaps not without its own interests in mind.

But the Kliper is nothing compared to the commercial development of helium deposits on the Moon. We cannot yet build our own reusable transport vehicle, but we freely indulge in talking about fantastic schemes to use the Moon, requiring an armada of transport ships. However, simply talking about this theme from many different podiums costs budget money.

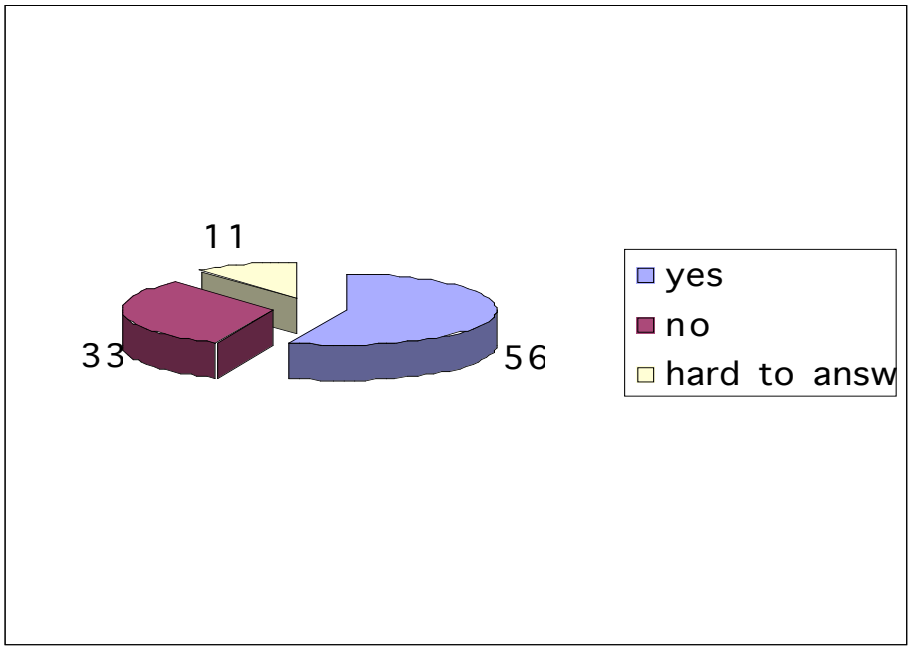
If we continue to stick to the "we-are-great-because-we-talk-great" principle, everything will be divided and redivided without us. But there is a different approach. It is enough to take a sober view of things, and our priorities will sort themselves out. We have a big head start in boosters. Fine. Let us focus on them and corner 70-80%, not 40%, of the

international market. Let us develop a rocket engine that will be sought after from every corner. A good example is the RD-180, which was supplied to the United States. True, this will call for a concrete, boring and prosaic effort, with no victories to chalk up. (15)

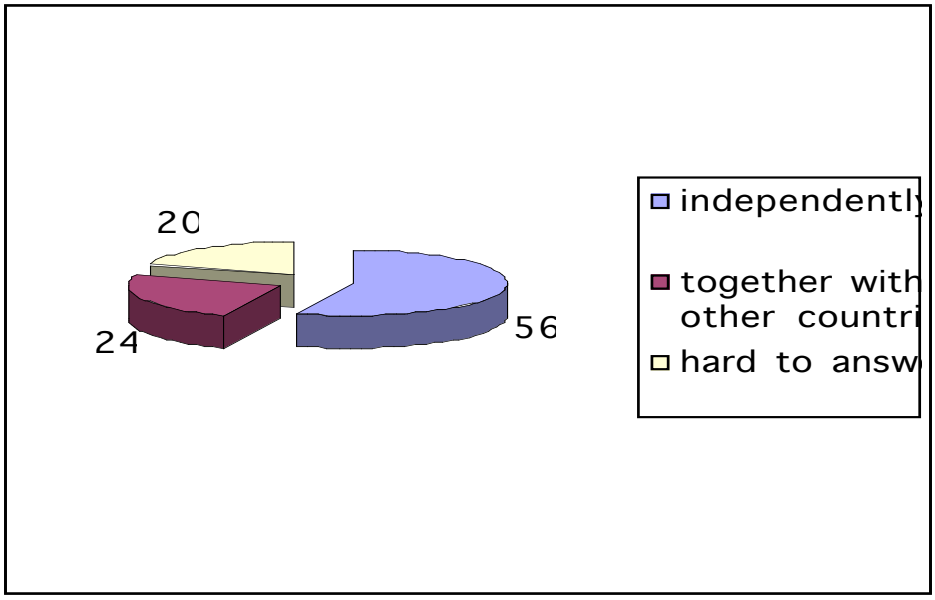
But then no space recarving will frighten us.

We have made a survey among our teenagers about Russian space programs. These are the results of our survey.

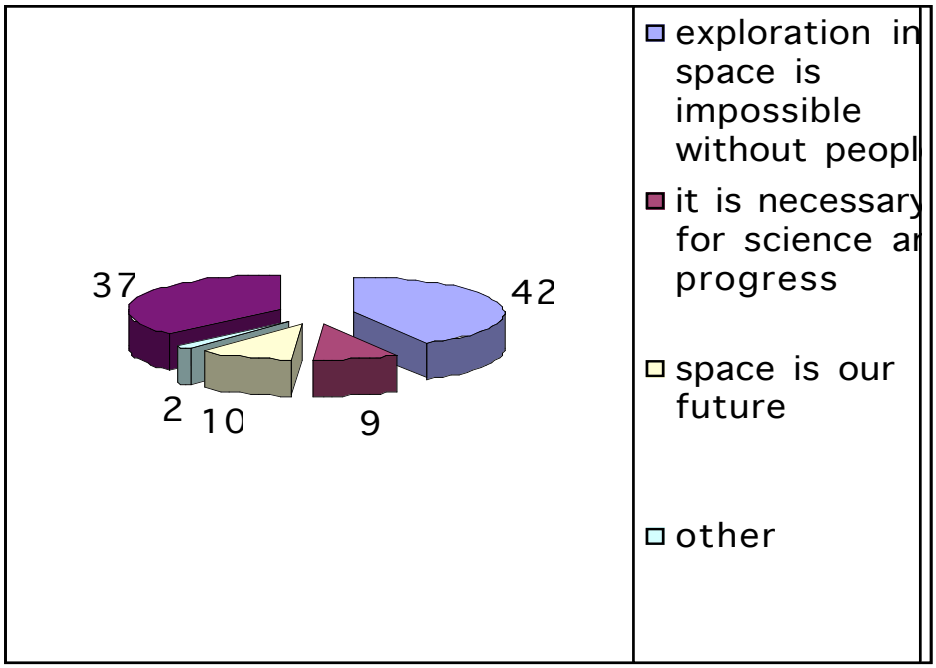
IN ITS TIME, RUSSIA WENT AHEAD OF OTHER NATIONS BY OPENING THE ERA OF SPACE EXPLORATIONS. DO YOU THINK RUSSIA IS MAINTAINING ITS LEADING POSITIONS IN SPACE EXPLORATION OR NOT?



SOME PEOPLE SAY THAT RUSSIA SHOULD EXPLORE SPACE INDEPENDENTLY. OTHERS SAY THAT RUSSIA SHOULD EXPLORE SPACE JOINTLY WITH OTHER NATIONS. WHICH IS CLOSER TO YOUR OWN VIEW?



WHY DO YOU THINK IT IS NECESSARY TO CONTINUE THE EXPLORATION OF SPACE BY SENDING PEOPLE THERE?



Exploration of space is impossible without people

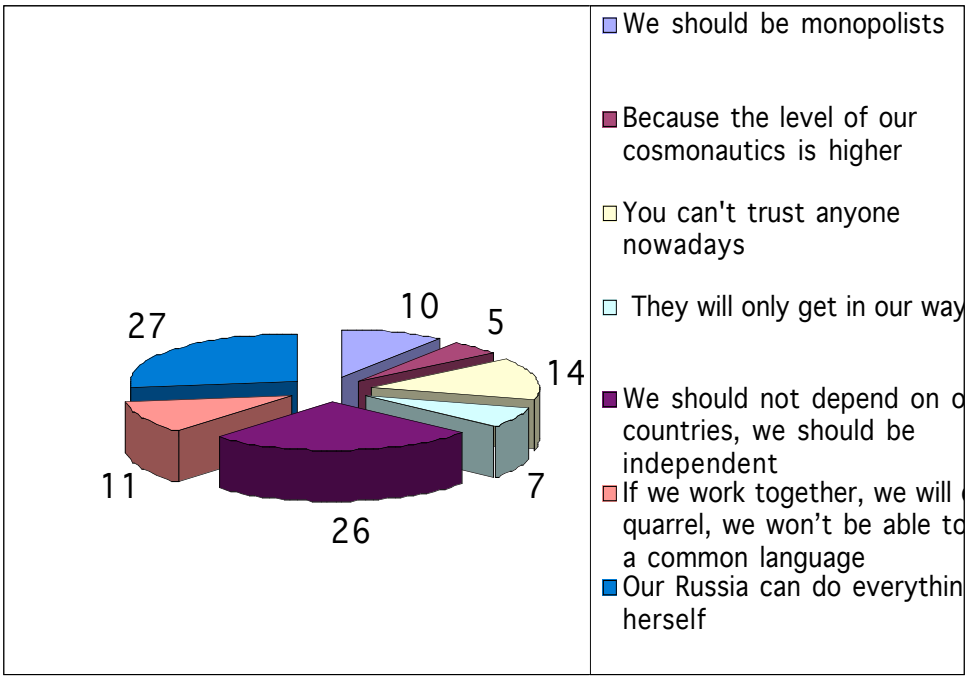
“Machines will not replace the human mind.” (Julia Alikina 10a)"In non-standard situations, people still react better than machines".(Alexander Aganin 10a); "people will figure out problems faster than computers"(Slava Novosyolov 9a); "I trust people more than technology" (Tima Ponomaryov 9a); "I think machines are useless without people" (Anton Zinoviev 9b); "there are things that only people can do" (Polina Komarova 10a); "people are better than

machines" (Anna Zubova 10b); "machines cannot do work that requires the use of the mind."(Olga Huntington 10a),People must control technology (Anton Sgibnev 9b), "The presence of a person is necessary".(Antonina Burlako 9a); "people need to control machines"(Anastasia Polkova 10a); "no matter how smart machines are, people still do the repairing"(Liza Levina 9b); "to better control things in space."(Ivan Pogodin 9b)

It is necessary for science and progress.

"So that science can continue to develop"(Danil Tissen 9a); "for progress in science and technology"(Anastasia Suzdalova 9b); "because it is needed for science" (Anna Chuloshnokova 10a); "civilization does not stand still" (Veronika Pyatkova 10b); "technical evolution continues"(Kirill Alexandrov 9a) ; "progress should not stop."(Tanya Gornitzkaya 9b); "We need to settle on other planets"(Anna Lobova 10a); "space exploration for the purpose of settling there in the future"(Ivan Balbotov 10a); "space is our future" (Anton Dementov 10b); "to make our future better."(Nick Popov 10b); "We need to know how to improve people's health in space and on Earth"(Nastya Strigova 11a); "they should spend money on the exploration of space, not on war"(Oleg Shmitov 11a); "to save mankind"(Yulia Novosoylova 11b); "people find it interesting to fly to space"(Dima Moryakov 11b); "interest in the unknown."(Andrew Margasov 11b)

WHY DO YOU THINK RUSSIA SHOULD CONDUCT SPACE RESEARCH INDEPENDENTLY?



We should be monopolists

"I am proud that the first astronaut was Yury Gagarin, a Russian"(Nastya Dumova 10a); "we should be the best and stay this way"(Anna Arlan\tzeva 10b); "we should continue to be leaders, at least in cosmonautics"(Kate Odintzeva 9a); "a leader should stay a leader"(Vitaly Bushlanov 10b); "we should do what we can do better than others"(Kate Balbashova 9a); "we have always been leaders in this area, so why give up leadership

positions now?"(Kate Ostyakova 9b); "because we were the first to enter space." (Ksenia Butorina 9b)

Because the level of our cosmonautics is higher

"we have powerful developments in this area"(Ksenia Negoda 9a); "we have everything for it: aviators, constructors, but no money"(Ivan Tomilov 10a); "because Russia has the best minds"(Mikhial Zorin 9a); "we have the most advanced technologies"(Nina Melnikova 11b); "Russia has a good basis, experienced scientists, high-quality spacecraft, and good astronauts"(Dasha Filippova 9b); "our spacecraft are more reliable than those of other countries"(Sveta Kutaeva 9a); "high responsibility in research"(Viktoria Belova 11b); "there will be fewer catastrophes." (Egor Rubakov 10b)

You can't trust anyone nowadays

"other countries can harm us"(Nikon Zhdanov 10b); "other countries will simply use us, no one takes us into account now"(Olga Tarakanova 10a); "they will take our money and leave nothing for us"(Artoym Sokolov 10a); "we are often cheated"(Roma Sobolev 10a); "there is no confidence in the partners reliability" (Kate Panteleeva 11a)

They will only get in our way

"we can do it better if no one is getting in our way"(Stepan Popov 11b); "we don't want anyone to prevent us from making discoveries"(George Koshelev 9a); "to avoid differences with other countries"; (Olga Leonova 9b)

We should not depend on other countries, we should be independent

"we should not depend on America"(Alexander Sshubin 9a); "if we are independent, they will not tell us what to do"(Andrew Popov 9a); "no one will dictate their conditions to us."(Svetlana Zavada 9b) "Russia should benefit from its research"(Kristina Ushatova 9b); "we can make money by fulfilling orders from other countries"(Yulia Bakina 9b); "in order not to share money with other countries, let them pay us, not vice versa"(Maxim Filin 11b); "we will keep the profits and will sell the results of the research ourselves." (Elena Stroshkova 10b))

If we work together, we will only quarrel, we won't be able to find a common language

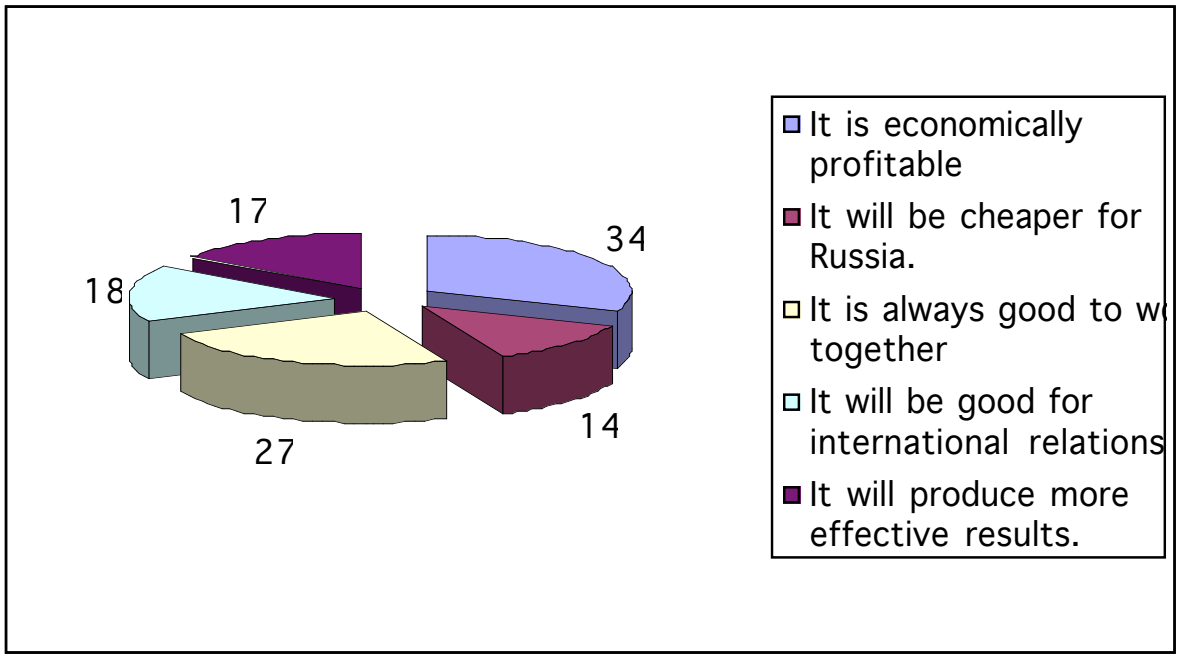
"Why does everybody need to know about it? Everybody has his own secrets"(Alina Kostrova 11a); "everything should be kept secret"(Alexander Aganin 10a); "we shouldn't disclose what we know"(Valeria Bogdanova 9a); "the research must be very important and we should not disclose its outcomes"(Anton Gomolko 9b); "we should not disclose our reserves to our enemies"(Alesya Belousova 9a); "nobody should know the results, especially for military purposes"(Mikhail Peganov 11a); "why disclose our secrets?"(Evgeny Peganov 11a) "Because they have suspended all launches for 1.5 years"(Evgeny Berger 11b); "to maintain our defense potential"(Alina Molodozhon 11b); "to create better conditions for our scientists"(Andrew Chekhlov 11a); "if you have done it yourself, you are proud of it"(Lubov Shikhova 9a); "our country needs to be active." (Ivan Rumyantzev 9a)

Our Russia can do everything herself

"If Russia is an independent country, and this means the research should be independent"(Anastasia Strigova11a); "we can do everything independently, why do we need foreign countries?"(Artyom Timerkaev 10a); "it will be better for us if we do it independently"(Danil Fiasullin 10a); "we should work towards our goals independently"(Kate Palkina 10b); "we have worked independently to this time and should continue this way"(Lisa Kotova 10b); "I think Russia can do it alone."(Konstantin Gnusarev 11a) "The world's attitude to

us will improve, they will start respecting us again"(Maria Vorozhtzova 11b) "Russia's authority in the world will improve, we have lost everything but space"(Tatiana Bolshakova 11a); "Russia's prestige will grow"(Nastya Uskova 9b); "let them fear and respect us"(Alisa Volodenko 9b); "Russia should be a great power." (Arina Kotlyarova 11b)

WHY DO YOU THINK RUSSIA SHOULD CONDUCT SPACE RESEARCH TOGETHER WITH OTHER COUNTRIES?



It is economically profitable

"We need money for research and we don't have any"(Kate Tuzhikova 11b); "Russia doesn't have adequate funding"(Kirill Golikov11b); "we don't have enough money"(Sveta Kutaeva 9a); "our economy is not very strong"(Evgeny Peganov 11a); "if Russia doesn't have money, other countries will help, although I think it's a shame"(Danil Tissen 9a); "our budget does not allow us to do it independently"(Anton Zinoviev 9b); "where is the money coming from? Other countries will be sponsors and we are poor right now"(Nick Popov 10a); "we are poor and cannot explore space."(Andrew Chigintzev 11b)

It will be cheaper for Russia.

"It will be easier financially"(Evgeny Panov 11a); "joint research is cheaper"(Tonya Burlako 9a); "if countries unite, the exploration of space will be cheaper"(Andrew Mikhialuk 11a); "the expenses will be shared"(Alesya Belousova 9a); "it costs a lot of money and therefore it will be cheaper to do it together"(Slava Mityunin 11b); "each country spends less money."(Danil Skvirtzov 11a) "Why spend only our own money?"(Oleg Shmitov 11b); "from a financial point of view it is more profitable"(Dima Okunev 10a); "economically speaking, joint research is cheaper"(Ivan balbotov 10a); "it's business. Let them pay us for ideas."(Anna Bazhenova 10b)

It is always good to work together

"It's hard to do it alone, it's better to work together"(Kate Anfyorova 10b); "we should help each other"(Vasilika Belova 10b); "it's very difficult, it's better to work together"(Mary Sinyova 11a) ; "there needs to be mutual assistance"(Mary Syomina 11a); "it's easier for everyone"(Olga Leonova 9b); "it has always been easier to work together"(Nastya Strigova 11b); "it's better when several minds work together"(Kirill Alexandrov 9a); "scientists from different countries should work together"(Slava Novosyolov 9a); "I think it's better to work together"(Alisa Volodenko 9b); "it's better to do it together."(Anna Zubova 10b)

It will be good for international relations.

"To develop friendship"(Kate Kanischeva 10a); "to develop friendship and promote peace"(Anna Chuloshnikova 10a); "space flights reduce political differences and therefore promote peace"(Lera Chistotina 10b); "it's good for international relations."(Evgenia Strigova 9b)

It will produce more effective results.

"More productive"(Alexey Shilov 10b); "work will be more effective"(Gleb Uvarov 9b); "there will be more results"(Nastya Shalaeva 11a); "cooperation will produce more effective results"(Dasha Polunina 9b); "cooperation makes more extensive research possible, which can speed up the exploration of space"(Lena Tumilo11a); "joint research will be better for science"(Lev Ulnirov11a); "it means more prospects for science"(Roma Sadiki 10b); "together we can learn more about space."(Masha Tunyova 11a))

I think there are **some serious problems** that we need to solve. And one of them is, of course, the problem of **space pollution** because of space debris that have appeared during the years of space exploration. The fate of an object in space depends on the altitude it is located at. Space stations rotate at the height of 400 -500 kilometers. The atmosphere still exists there and it slows down an object. The object looses its speed and within a couple of years enters dense atmospheric layers where it fully burns out. A lot of objects happen to rotate beyond the atmosphere. The scientists have found out two peak altitudes the objects are concentrated at: about 800 and 1500 kilometers. Another group of objects is located in the geostationary orbits - about 36 thousand kilometers above the Earth surface.

As there is no atmosphere to affect flights there, the object will continue to rotate around our planet for a long time. The objects concentration there is accountable - it is at these heights that various communication satellites and other useful devices are located. The more objects are in orbit, the higher the risk of collisions is.

During the 40-year period of active space research an operating satellite once has happened to collide with a large object, resulting in the loss of the French space satellite. "Mir" station and American "Shuttle" spaceships have undertaken several maneuvers to avoid the clashes. Even the International Space station that is not fully operational yet has already conducted an escape maneuver. However, in terms of flight safety the risk of a dangerous collision with a space object

is very high: for a single operational module of this station it makes 5-10% within the 15-year estimated operation period.

Generally, space debris can be divided into two categories: the objects, which can be seen through a telescope and the objects too small for regular observations. It is easier to work with the first category (the objects being more than 20 centimeters in size) because they are registered in the catalogues, their number slightly exceeding 8,500. Half of these objects were created as a result of satellite and carrier rocket destruction. Astronomers have altogether recorded more than 150 explosions in space. (11)

The debris that can not be seen through a telescope is more difficult to deal with. Its particles sizing millimeters and flying at the speed of 10 kilometers per hour are capable to damage a satellite or a space station: spoil a solar battery or, even worse, to make a hole in a fuel tank. But these particles are incalculable. Therefore the scientists are developing simulators which allow forecasting the behavior of such small objects. The countries involved provide for different simulators, the computation results varying by dozens of times. Our scientists consider these variations to be acceptable; such deviations are quite insignificant when computing millions of objects, particularly millimetric debris particles flying in the near-earth orbit.

Applying their model, the specialists from the Center for Space Observations (Rosaviakosmos) have investigated future development of the near-earth space pollution process. They have reviewed five scenarios:

1 - everything remains unchanged;

2 - the number of explosions reduces by half;

3 -the number of carrier rockets in space reduces by half;

4 - all (or half) satellites and carrier rockets return to the Earth;

5 - all the above measures are taken simultaneously.

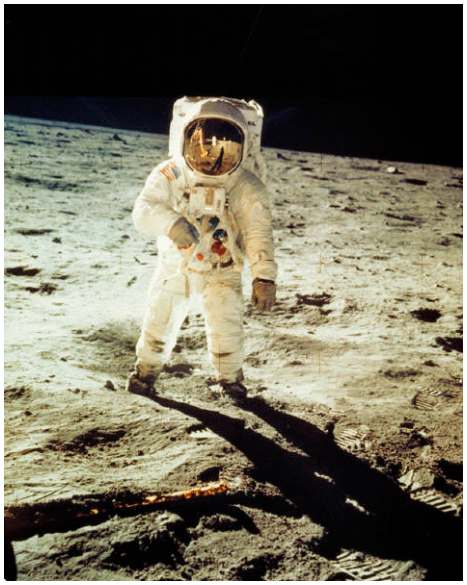
It has appeared that in case of scenarios 1-3 the debris volume in orbit will grow up by 2-3 times by the 22nd century. Provided all the above steps are implemented (the number of explosions goes down and all flying objects return to the Earth), this will allow reducing the debris volume by 1.5 times within the next hundred years. Foreign scientists have made similar conclusions. (12)

Unfortunately, there is no quick way to achieve it, because this entails immediate expenses growth. *First of all*, it is necessary to change the carrier rockets design so that the waste stages descended to the lower orbits. *Secondly*, additional fuel will be needed for each satellite to allow its descend to the atmosphere. However, the space pollution is close to critical, so these expenses appear to be unavoidable.

I am sure that without moving forward mankind starts moving backwards. And we cannot allow stopping the development because we have new technologies and science. Besides we have got a lot of problems solving which will not allow stopping the development of science. The mankind stands in front of *ecological and energetical crisis*. And it is silly to cry that it is the science's fault, because only science is able to remove us from this crisis. Our civilization is an alive growing organism and these problems are the problems of growth. To reject solving them means to stop the development of the civilization.

So, what do we need cosmos for? The development of new space technologies can give us “bread and power” as Tsiolkovsky said. But beside this, new territories must become the new range for the new scientific and sociological experiments. The development of space is the most important task which has ever stood in front of the mankind. But our society cannot solve it because it is not advances enough. This important task can and must become the new rod of the development of our society.

We cannot decide these problems using our usual methods. We should use new technologies and create the new type of the society.



For example, energetic crisis is caused by our consumer attitude to our natural resources because our industry works on producing waste products. The development of space technologies will force us *to create new closed life-support systems* which should provide the life of the great amount of people. In these systems the ideal balance between the nature and technical world will be found. The creating of these systems will help us to solve some environmental problems. And this is not the only possibility that cosmos gives us. *The creation of the new free society*, which will be more progressive and happier, is also possible in space, the society where everyone should be able to realize all the abilities given by nature. From history we know that the human being has never stopped the increasing of the sphere of his influence. In this case cosmos is the new horizon that satisfies our requirements. If we work together we will built *a new constant orbit station near the Earth*. The astronauts and scientists would carry out their experiments and researches there. We would create the center of solar energy and this center would send this energy to the Earth. So we could solve one of the most important problems of nowadays. Then we can build *a Luna base* and get a lot of minerals from it. It is reasonable to build *the other base on Mars* as it is more or less hospitable planet because its temperature and atmosphere are similar to the climate of the South and the North Poles of the Earth. The following stage is *natural satellites of major planets and a zone of asteroids*. For the science minor planets represent the remarkable monuments giving the opportunity to understand an origin of Solar system. On some of them there is water and organic substances. More than hundreds from them have more than a kilometer in diameter and could be used as natural bases. It is possible to take oxygen, nitrogen and carbonic gas from the nearest space, and maybe one day an artificial atmosphere will be created in the zone of asteroids. And more human beings will live there than on the Earth.

The other question for the mankind is *an opportunity of space flights to other stars or space tourism.* As soon as the problem of independent flights in space will be solved, rough construction of orbital hotels will be started and some specialists are ready to it even now.

There are **some projects** that approach us to our dream. And now I would like to give one of them as an example. This is the "**Transparent World**" educational project.

ScanEx Center initiated the new educational space project “Transparent World”. The project envisages the manufacturing and launch of the micro satellite with optical equipment into the orbit. It will be able to deliver middle resolution images (around 50 meters) to a network of

ground receiving stations, deployed in the university, research and regional centers in throughout the world.

The principle objective of the "Transparent World" project is to demonstrate the possibility of creating an affordable and easy-to-access source of operational space information about the natural events and processes, happening on Earth, for further use in education, science and economy.

Advantages of the "Transparent World" project:

1. low costs, light weight, hitching a ride with a primary payload of the domestic launch vehicles;
2. wide use of reliable design concepts, of tested and commercially affordable assemblies and sub-systems;
3. free access to space video-information, transmitted in real-time, drawing the attention of a wide range of potential users to the project;
4. possibility to use images from space in education, science, research and in practice.

At the first stage, a pilot lightweight nanosatellite of 12 kg is to be launched to test the technical solutions. *At the second stage*, a system of 5-6 nanosatellites is anticipated to be deployed, providing for the overview of the entire Earth surface during a day. Satellites are to be inserted into one orbital plane, but with different equator crossing times, allowing a ground station to receive multi-temporal images from different satellites within the entire station footprint.

An important difference of the "Transparent World" project from the other ones is a continuous *Earth data transmission* in the so-called direct *broadcasting mode* to any world ground receiving station. To date, only the American Terra and Aqua MODIS sensors' low resolution images (250 m to 1 km) are available in direct broadcasting mode. It is the free data access philosophy of the Terra and Aqua satellites that made MODIS data so popular worldwide. According to NASA, currently over 120 world ground stations receive MODIS images, Russia included. Access to higher resolution images delivered from IRS, LANDSAT, SPOT satellites is chargeable. The 50 meter data, delivered in real-time mode from the would-be "Transparent World" nanosatellite can be in demand due to accessibility and can be acquired by the education centers at universities and high schools, as well as by the scientific, departmental and regional monitoring centers.(10)

Another one is "Transparent World" *micro satellite.*

The micro satellite has been designed based on the nonpressurized platform with 3-axis attitude control system. Optical-electrical camera provides for Earth imagery with a spatial resolution of 50 m in the swath width of 400 km in four spectral channels. The selected spectral channels (green-blue, yellow-green, red and near infra-red) enable to resolve a wide range of practical and scientific tasks, such as water surface pollution definition, vegetation assessment, fire and flooding areas detection, vegetation index calculations, etc.

For the 3-axis attitude special gyro flywheels and magnetic coils have been designed, whereas star mappers and magnetometers are used as sensitive sensors.

Navigation in the outer space is supported by the onboard GPS receiver and the orbital parameters are corrected using the propulsion system with a thrust of 0.003 N. Video images from optical camera will be delivered via the transmitter at the rate of 32 Mbps, with power consumption of 40 W and the weight of 1.6 kg.(10)

The power supply system is complete with the gallium arsenide photo converters, lion battery and float charge and onboard potential distribution system. The peak load is over 70W at the daily average power consumption of 40W. The onboard control, commanding and telemetry system of 800 grams and 2W of consumption, including the radio-link, has been successfully tested during multiple launches and multiyear operation.

There is another one which I would like to present. It is the project of building *optimal inflatable space towers* with 3 - 100km height. Theory and computations are provided for building them up to one hundred kilometers in height. These towers can be used for tourism, scientific observation of space, observation of the Earth's surface, weather and upper atmosphere, and for radio, television, and communication transmissions. These towers can also be used to launch space ships and Earth satellites. These projects are not expensive and do not require rockets. They require thin strong films composed from artificial fibers and fabricated by current industry. The towers can be built using present technology. The towers can be used (for tourism, communication, etc.) during the construction process and provide self-financing for further construction. The tower design does not require work at high altitudes; all construction can be done at the Earth's surface. The transport system for a tower consists of a small engine (used only for friction compensation) located at the Earth's surface. The tower is separated into sections and has special protection mechanisms in case of damage. Problems involving security, control, repair, and stability of the proposed towers are addressed in other publications. The author is prepared to discuss these and other problems with serious organizations desiring to research and develop these projects.(10)

The method, installation, and estimation for delivering payload and missiles into outer space were presented in the World Space Congress, Houston, TX, United States, 10-19 Oct. 2002. This method uses, in general, the engines and straight or closed-loop cables disposed on a planet surface. The installation consists of a space apparatus, power drive stations located along trajectory of the apparatus, the cables connected to the apparatus and to the power stations, a system for suspending the cable, and disconnected device. The drive stations accelerate the apparatus up to hypersonic speed. The estimations and computations show the possibility of making these projects a reality in a short period of time (see attached project: launcher for missiles and loads). The launch will be very cheap $1-$2 per LB. We need only light strong cable, which can be made from artificial fibers, whiskers, nanotubes, which exist in industry and scientific laboratories.(9)

We will create *a new method and transportation system to travel to the Moon*. And now it is being created. This transportation system uses a mechanical energy transfer and requires only minimal energy so that it provides a 'Free Trip' into space. The method uses the rotary and kinetic energy of the Moon. This paper presents the theory and results of computations for the project provided Free Trips (without rockets and spend a big energy) to the Moon for six thousand people annually. The project uses artificial materials like nanotubes and whiskers that have a ratio of tensile strength to density equal 4 million meters. In the future, nanotubes will be produced that can reach a specific stress up 100 millions meter and will significantly improve the parameters of suggested project. The author is prepared to discuss the problems with serious organizations that want to research and develop these innovations.

Thus, in the conclusion I can say that before mankind there is a problem of transition to a new step of development. The huge prospects of development of future space are opened to us. Its development does not promise to be simple and easy, the person should enclose both mental abilities, and enormous financial resources that economically advanced states presume to themselves only. If it is possible to them, the huge world will open to them. And all immense space will be in front of them.

BIBLIOGRAPHY AND OTHER RESOURCES

1. http://www.spacelawstation.com/worldgov.html
2. http://cns.miis.edu/research/space/treaties/index.htm
3. http://portal.grsu.by/portal/LIBRARY/CD1/laws/trty/index.htm
4. http://www.kremlin.ru/eng/text/docs/2004/11/79801.shtml
5. http://www.dfait-maeci.gc.ca/arms/outer3-en.asp
6. http://www.russia-ic.ru/education_science/science_overview/370/
7. http://www.metallpress.info/content/29563.html
8. http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf.
9. http://www.space4peace.org/articles/spacepower.htm.
   http://www.atlasaerospace.net/eng/newsi-r.htm?id=1779
10. http://www.rosalux.ru/main/modules/articles/article.php?id=10
11. http://www.britishcouncil.org/ru/science-projects-space.htm
12. http://www.kurort-servis.ru/article-182986-en.html
13. http://www.unesco.ru/eng/articles/2004/Admin1394.php
14. http://www.volgaspace.ru
15. http://www.lonelyplanet.com