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SPORT COMMERTIAL PILOTED EXPEDITION TO MARS WITH A HUGE SCIENTIFIC EFFECT

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Abstract

The report will be dedicate expedition to the Red Planet. This expedition to Mars and its satellites Phobos & Deimos. The project is worked out enough for its implementation for an amount not exceeding 250 million USD! The project provides for its implementation in the next four years! The reliability and safety of the expedition have been worked out by the author of the report to a sufficient extent. The project is designed with a quite comfortable journey of one or two pilots to Mars. The level of project development is TRL-2

Keywords: Mars, Expedition, Solar Tug, Martian Rover.

1. Introduction

A commercial flight to Mars with a crew on board, like any commercial event, requires that the project not only pay off, but also make a profit. If an investor invests money, he must definitely make a profit! However, in order to make a profit, it is necessary that the project be profitable, and this, in turn, indicates its maximum cheapness. What can be said about a seemingly grandiose project like a manned expedition to Mars? What kind of profit can be made if everywhere we hear about some trillions of dollars that are needed for this? The advertising industry, the sports industry, the show business industry knows how to make a profit by investing 250-300 million dollars in a project! These are already statistical data that, for example, by investing $ 250 million in a film [2], you can get at least a billion in profit. A well-known company [1] has invested 50 million dollars in the famous jump from space of a famous athlete, which is also a vivid example of the fact that promotional events are of great interest to business.

In 2004, voicing a rather costly and complex project of a manned expedition to Mars for six crew members, worth $ 3.5 billion, **Fig.1**. I already conducted marketing research and commercial proposals for investors were and were of interest to potential investors. Later, a commercial Mars project was even proposed by a famous space tourist worth $1 billion. [3]

Fig.1. My first commercial project for a real commercial manned expedition. For the first time, the concept was proposed to assemble an expedition from what is at hand. The cost of the expedition was reduced from $20 billion to $3.5 billion. In 2004, a positive review was received from a major space agency and a space activity license was obtained for this first manned expedition to Mars in 2009.

The amount of 3.5 billion is quite extreme for investors who want not only payback, but also profit. That's why I developed a profitable expedition with a rather modest budget. No more than 250 million dollars! The Moon, Mars, Mercury, Venus, the asteroid belt are proposed for the first commercial flight. However, there have already been people on the Moon and the next event may be Mars.

2. Material and methods

Even using statistical data, one can understand that such a project will bring not a small profit to the investor in several business niches. Here, perhaps, there is a share of tourism, and a share of an extreme sports show, and, of course,

advertising projects, as well as filming episodes for films, leasing seats on the ship and overboard to scientific groups to accommodate their scientific equipment. All this will pay for more than one expedition. The next expeditions will only be cheaper and will provide work for companies involved in exploration geologists. There is a lot of work, there is an infinite amount of it, just as the cosmos itself is endless. To reduce the cost of the technical part of a commercial expedition to Mars, I decided to use simple and inexpensive means to deliver manned interplanetary complexes to Mars using thermal rocket engines that can be powered by solar energy. Such experiments have already been carried out with less successful devices. [4], [5]

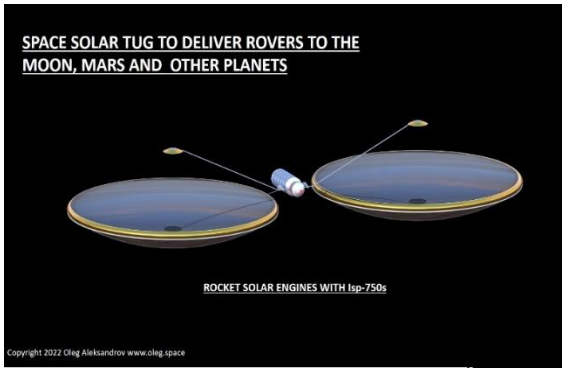


Fig.2. Now using a simple and reliable solar tug with the latest technical solutions, which I patent, and reducing the number of commercial crew to 2 people, I was able to reduce the cost of an expedition to Mars to 250 million dollars!

Using lightweight inflatable concentrators that can be stored on board in quantities of up to 5 pieces or more for different stages of flight. To place the heat exchanger in the focus of such a concentrator, I will use lightweight rods in the form of a multifunctional manipulator**. Fig.2**. This method will allow me to capture and place not only the focal heat sink, but also cargo, as well as spacesuited astronauts and equipment. Moreover, I plan to make a heat exchanger in the form of a rotary turret with a set of tools that will make it possible to turn a solar concentrator and use it for astrophysical observations in the radio range. Even so, the hub would allow a commercial service for radio astronomers, such as a long-range radio interferometer. The same concentrator will allow a lot of experiments on radio communications and experiments with lasers. This type of propulsion system allows you to increase the specific impulse to 500-1200 seconds like a nuclear rocket engine and fit into one launch of a rocket with a carrying capacity of only 17-22 tons**, Fiig.3.**

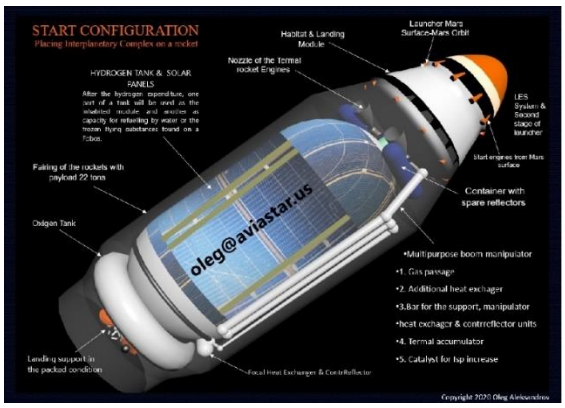


Fig.3. Using a solar tug with a specific impulse of 750-9000 seconds, I managed to place the entire expedition in one rocket with a payload of 17- 22 tons.

which can be ordered for only 35-60 million dollars via the Internet like pizza. Guys, this is business! Only with the help of this solar tug can a long mission to Mars be provided with everything necessary for a commercial flight. This is artificial gravity, this is powerful radiation protection, this is the most reliable life support system for the crew, these are additional opportunities for comfort. It might seem that this type of rocket engine will compete with nuclear tugs? No, this type of engine will not compete in any way with corporations that develop space nuclear rocket engines for the global industrialization of space. The tug will not compete with promising nuclear space tugs and will become even more of a modest addition to them, as an emergency power-propulsion system ("reserve parachute"), providing emergency energy even in areas of the Pluto orbit. And what can be competitors, for example, private sports or cruising sailing yachts or solar-powered yachts to modern nuclear-powered icebreakers or nuclear submarines? I consider the following method as promising to use mobile bases on Mars. At the first stage, a Rover with a drilling rig will be used, which will allow deep drilling of the Martian soil within 10-150 meters. During the first flight to Mars, this installation will begin to make a profit both for scientific groups interested in research and for geologists who will definitely order such work. The main feature of the rovers is their ability to connect to long-term scientific or tourist bases and entire villages**. Fig.4.**

Fig.4. For a commercial expedition, as before, I use a long-range manned rover. I have developed a new concept that will allow, with a large number of missions, to connect them with each other into a single research or commercial tourist station.

For many months, such bases can be protected by a two-meter layer of soil, which is easily erected and dismantled, making it possible to travel further.

Well, it is impossible to bypass the main method of commercialization of manned space flights not only to Mars, but also to other planets of the solar system - this is interplanetary tourism. I am currently working on these projects, for example, how do you like a scientific and sports tourist flight to Venus with a visit to its surface by two three tourists for the same money 250 million dollars for two? As it turned out, no problem! I can build it now. Yes, it is to build with your own hands, as Picard's team did and fly! And fly with one launch of a carrier rocket using the technique of heating hydrogen in the sun! Making a tank for long-term storage of hydrogen is also not a problem. If you don't want to go to Mars, we fly to Venus and fly there on a bathiplane! If they tell me not to fly there supposedly phosphines and potential bacteria! No this is speculation! However, of course, there are flight licenses and rules, but, fortunately, there are also many technical solutions for testing equipment, including the means of sterilizing them, even for the extremely lifeless Venus, which itself will sterilize anyone very well!

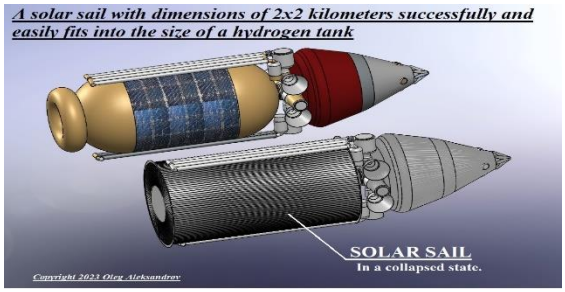


Fig.5. A solar sail with dimensions of 2x2 kilometers successfully and easily fits into the size of a hydrogen tank. At the same time, the manned complex does not change constructively.

As fantastic as it sounds, the use of a solar sail can also be considered for a technique for propulsion in space**. Fig.5. Fig.6.** The method of making an expedition to Mars for two tourists will be as follows: 1. launching a carrier rocket with a manned spacecraft of 17 tons into an orbit of 550 km. without a crew. Deployment of a solar sail measuring 2x2 km. 2. acceleration of the solar sail to the moon within 80-100 days with the exit to the crew waiting orbit (lunar orbit). 3. Launch of a light manned spacecraft with a crew to the moon with access to the moon's orbit in 3-4 days. Docking with a sailing expeditionary spacecraft. 4, Acceleration with the help of a sail from the orbit of the moon to Mars. It is possible to pre-train the crew and test the equipment with the landing of the crew on the moon during another launch of the carrier rocket. (Three-launch scheme of the expedition). With a sail acceleration of 1 mm/s2, a 1.5-year expedition to Mars with a stay on Mars of 30 days is possible.

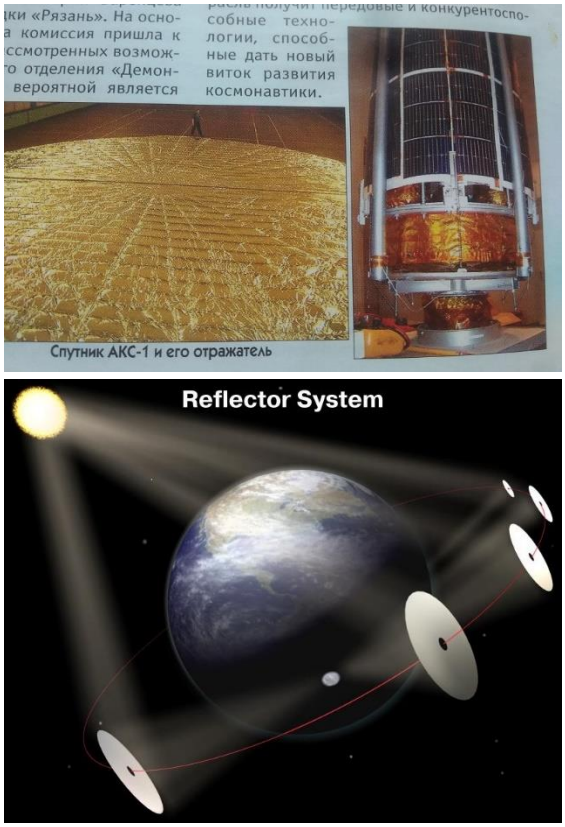


Fig.6. In 2001-2004, the author of the report carried out work to study the possibility of manufacturing solar sails - reflectors with dimensions of more than 2x2 kilometers. Experiments were made and optimistic conclusions were drawn on the actual deployment of such designs.

But most importantly, the construction of universal reflector sailing tugs will make it possible to carry out, in addition to an expedition to Mars and other bodies of the solar system, a number of commercial projects, such as space mirrors for illuminating the night regions of the earth from space, **Fig.6**. the fight against global warming, the fight against space debris, advertising light show. And what about the first steps in terraforming Mars as early as 2027? Yes, experiments on lighting the night regions of Mars while the crew is working on the surface. And experiments on additional insolation of the illuminated regions of Mars. **The Reflector Sail is a real business!**
Speaking about the methodology of the sports component of this report, the expedition can be organized in a sports mode. For example, like a regatta. The investor finances at least two rocket launches or more, with a payload capacity of 17 tons for one pilot or 22 tons for two. And in the competitive mode, the sports-explorers demonstrate the marvels of navigation, control and fuel economy in order to be the first to arrive at their destination and take their small step and leap for humanity on a new planet.

3. Results

The result of a selective analysis of some project options will be its main key elements, without which it is impossible to carry out an expedition to Mars with one launch of a carrier rocket and meet the minimum amount of money. It is, of course, a solar tug. Therefore, experiments were carried out on its main structural elements. Tests have shown greater stability of such structures and 20 meters in diameter and 50 meters. Two 50-meter parabolic reflectors are planned to be used in the project of a commercial manned expedition to Mars. Environmental friendliness, simplicity, will allow the project to be implemented in the next 3 years!

The project has been developed up to the level of TRL-2 and is at the stage of transition of development to the level of TRL-3 for the manufacture of the technical part. Separate key elements of the project, such as, for example, a universal space tug with a thermal rocket engine with a specific impulse of more than 750-1200 seconds, were partially and successfully worked out and tested by the author of the project back in 2005 and are at the TRL-3 level. **Fig.7.**

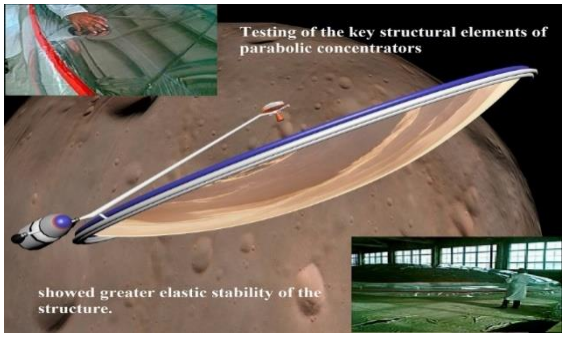


Fig.7. In 2005, I already conducted a series of successful experiments with pneumatic solar energy concentrators larger than 10 meters. Experiments have shown the efficiency of my calculations and technical solutions for their manufacture and application in practice.

<u>The cost of the project consists of three main options:</u>

1. Conducting an examination of the project by specialists of the leading space agency (country of your choice) and obtaining the necessary licenses for this expedition. (The author of the project already has this experience in obtaining a positive examination and licensing for a pilot project of a manned expedition to Mars, **Fig.8.**

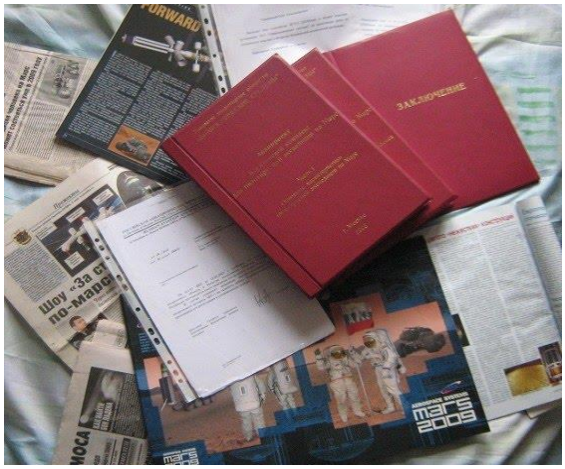


Fig.8. In February 2002, I opened a space company, developed the concept of a commercial expedition to Mars, where for the first time I suggested using ready-made certified modules, components and assemblies. The project passed a positive examination in a major space agency and my company even received a license in 2004 to continue work.

which is incomparably more complex and much more ambitious in terms of technical solutions and cost). My new project is much cheaper, more reliable, easier and absolutely environmentally friendly and does not use hazardous toxic high-boiling fuel components either for basic maneuvers or for orientation of the complex.
2. Payment for launch services. (The launch services market is becoming more attractive and diverse) According to official information from various companies, the service will amount to no more than 35-63 million USD for the delivery of 17-22 tons of cargo to low earth orbit.
3. Expenses, including unforeseen expenses, for the construction and development of the technical part of the project in accordance with the standards adopted in the space industry for individuals and companies.

The timing of the project also depends on several options:

1. Start of the 950-day expedition along the Homan trajectory already in November 2026. A very soft, safe and absolutely reliable option from the technical point of view. However, it requires great enthusiasm from the crew so that time flies unnoticed. The expedition will allow you to perform a huge number of tasks to study the surface of the planet Mars, using a self-propelled manned vehicle, as well as slowly explore its satellites Phobos and Deimos**. Fig. 9 and Fig.10**. In addition, the study of human capabilities directly in action will provide an indispensable service for the further exploration of deep space by public and private companies. And finally, it will close all questions on the impact on the crew of a long-term space flight. Moreover, the author finally resolved the issue of protecting the crew from hard cosmic radiation (HCR**)** in such a long flight, since the ship's energy makes it easy to do this.

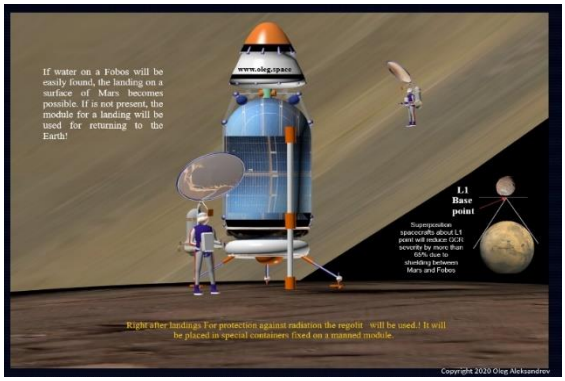


Fig.9. For the study of Phobos and Deimos, I plan to apply radiation protection using double shielding by the satellite of Mars and the planet itself. By placing a habitation module deep in a crater opposite Mars, radiation can be reduced by 80-99 percent!!!

The project according to the first option also does not require the costs of working out the re-entry into the earth's atmosphere with the second cosmic velocity, since the re-entry velocity will be easily extinguished to 8 km per second by jet braking. Despite the unfavourable year in terms of energy, 2026 when flying with a specific impulse of even 750 sec. is not noticeably heavy. This option, however, provides for an emergency reduction in the total time of the expedition to 450 days with no more than 10-15 days of stay in the vicinity of Mars.
2. Start of the 450-day expedition in 2028. The expedition will be quite energetically costly and less valuable for scientific work. The technical side of the project requires careful development of the process of entering the Earth's atmosphere with an extremely high speed of approach to the Earth.
3. Start of the 152-day expedition in 2030. The option is extremely extreme and requires careful study of another type of power propulsion system directly in space to its absolute reliability. However, noticeably short times are very suitable for tourist flights to Mars starting from 2030.

4. Conclusions

The commercialization of manned projects to Mars can begin now, this allows us to make technical solutions that can ensure the absolute environmental friendliness of the project, simplicity and reliability! To do this, we just need to start the project. The author of the report solved all the technical problems of such an expedition, which will make it possible to fit into the amount of no more than 250 million dollars using a special solar tug. Expedition formula:

One launch of a carrier rocket with a carrying capacity of 22 tons - two travelers!

will allow you to increase the number of crew by parallel launches. This formula allows you to significantly increase the reliability of expeditions and safety in the event of an emergency situation of one of them. The crew of a nearby flying complex can always shelter the crew of another!

So, a commercial project of a 950 or 450-day manned expedition to Mars and back is offered to the attention of investors. To Mars, which has already been conquered by robots from different countries and is waiting for the first sports tourist, who will finally open the era of commercial interplanetary expeditions by paying no more than 250 million dollars! Everything is already on the market for this: certified launch vehicles from private and public companies from different countries, and my inexpensive project for a safe and very, very reliable expedition to the surface of the sensational red planet and, most importantly, no less reliable return to earth! This will not be a competition to global state projects for the industrialization and colonization of the planet - it will be an ordinary private expedition that can solve a huge number of scientific problems in parallel. The problem of bacteria in the upper soil layer on Mars has already been solved by automatic devices and it is not there, all the dust and upper soil have been mixed by dust storms for hundreds of millions of years, and each grain of sand has been carefully sterilized by ultraviolet light. Therefore, here we can only talk about speculation on the topic of bacteria, but this does not mean that this project does not provide for measures to sterilize equipment and spacesuits, these measures are provided for very seriously! As for deep drilling, where theoretical traces of theoretical organisms can theoretically remain, then deep drilling is not an end in itself of the expedition, in this case the drilling unit will be attachments supplied by a specialized organization.

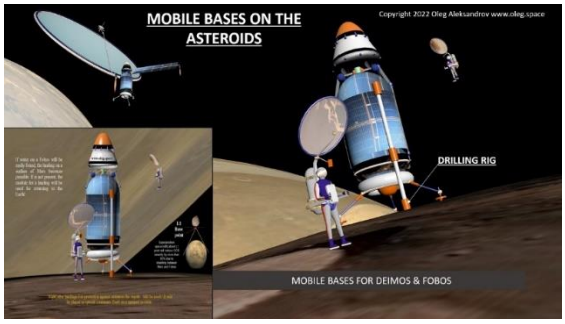


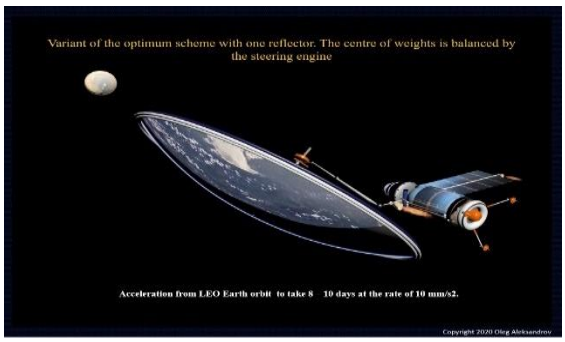
Fig.10. And to travel on the moons of Mars, I'm going to use a thermal rocket engine powered by water mined directly on them.

Brief investment roadmap.

1. May 2023 Signing an agreement of intent and confidentiality with the investor. Full familiarization of the investor with classified information on this project. The investor can choose one of five project options. Variants of devices for the study of the surface of Mars. (Fixed spacecraft and mobile options such as manned rovers, manned motor gliders, manned helicopters.
2. June 2023 Submission of a preliminary design to the space agency chosen by the investor for the examination of the project and receiving instructions for further approval of the project and its support at all stages of implementation up to obtaining a flight license.
3. September 2023 Obtaining a positive decision and instructions for interaction with space agency specialists.
4. September 2023 Signing a contract, the owner of the project with the investor for its investment.
5. September 2023 Start of investment. Payment for the launch service, ordering a launch vehicle for launch in early November 2026.
6. October 2023 - October 2025 Production of tests, modules, components and assemblies for the expedition. Parallel crew training.
7. October 2025- February 2026 the final demonstration before the commission of the space agency of the interaction and performance of all the technical components of the manned complex.
8. February 2026 -May 2026 Registration of a flight license. IEC assembly.
9. May 2026 - October 2026 Transportation of the assembled IEC to the launch site. Mounting IEC in the launch vehicle fairing. Carrier launch into low Earth orbit

10. October - beginning of November 2026 Final testing of the elements of the complex in Earth's orbit. Acceleration to Mars.

In conclusion, we can say the following: You can fly to Mars not only with the help of a solar rocket engine, but also with the help of a sail. And despite the fact that a three-launch launch scheme was used for flying with a sail, the cheapness of the sail and its potential allows you to meet the same 250 million dollars.



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