

Space Engineering

information about the heart health of cosmonauts. Data from the device will be transmitted wirelessly and doctors can see the indications of health of cosmonauts. The use of lithium-polymer batteries allow to use the device for several days without recharging.

REFERENCES

1. L. Sitnik, Spacehealth, [Электронный ресурс] – URL: <http://vtbrussia.ru/tech/kosmicheskoe-zdorove>, режим доступа – свободный.
2. Jan Wittry, Nancy O'Bryan, NASA's Glenn Research Center. Keeping the Beat [Электронный ресурс] – URL: http://www.nasa.gov/vision/earth/technologies/heart_monitor_feature.html, режим доступа – свободный.
3. Todd T. Schlegel, MD NASA-JSC Houston, Dry Electrode Harness System for Wireless Self Acquisition of Resting 12-lead ECGs to Android Smart Phones [Электронный ресурс] – URL: http://www.nasa.gov/pdf/658836main_03_3_NHPC2012_Schlegel_ECG%20Harness%20and%20Android_schlegel_panel.pdf, режим доступа – свободный.
4. NimbleHeart delivers wearable 12 lead ECG harness to NASA for astronaut monitoring [Электронный ресурс] – URL: <http://www.prnewswire.com/news-releases/nimbleheart-delivers-wearable-12-lead-ecg-harness-to-nasa-for-astronaut-monitoring-300112648.html>, режим доступа – свободный.
5. Yu Mike Chi, Dry-contact and noncontact biopotential electrodes, IEEE REVIEWSM IB BIOMEDICAL ENGINEERING, Vol. 3, 2010. P. 106-118.
6. Overchuk K.V., Uvarov A.A., Lezhnina I.A., Modification of the Algorithm Processing and Control Hardware Functions in the Portable Electrocardiograph for Use in Space Industry, Collection of scientific papers III Russian forum for pupils, students, post-graduate students and young scientists with international participation, Vol.6, 2015. P. 353-355.
7. Starchak A. S., Electrocardiograph as a Space and Ground Support Equipment, Collection of scientific papers III Russian forum for pupils, students, post-graduate students and young scientists with international participation, Vol.6, 2015. P. 386-389.
8. Overchuk K.V., Boyakhchyan A.A., Uvarov A.A., Soldatov V.S., [Электронный ресурс] – URL: <http://www.scienceforum.ru/2016/1552/23148>, режим доступа – свободный.

COLONIZATION OF PLANETS BY HUMANITY: MYTH OR REALLY?

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КОЛОНИЗАЦИЯ ПЛАНЕТЫ ЛЮДЬМИ: МИФ ИЛИ РЕАЛЬНОСТЬ?

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The humanity seeks for conquering a galaxy. Colonization of other planet will be one of the biggest step to space exploration. The humanity have managed a lot of achievements in the space exploration sphere in short period of time. Many researches of space have been realized. Many planets have been explored for determination of

possibility for their colonization, and methods how they can be reached . Among all the planets of the solar system, Mars is the most similar to Earth. In this article it is written about colonization of this planet. It will also consider projects that are currently developing in this area.

Человечество стремится покорить галактику. Одним из самых больших шагов к освоению космоса будет колонизация другой планеты. В течение очень короткого времени человечеству многого удалось достичь в области космонавтики. Были проведены многочисленные исследования космоса. Было изучено много планет для определения возможности их колонизации, а также способы добраться до них. Среди всех планет солнечной системы планета Марс имеет самое большое сходство с Землёй. О колонизации этой планеты будет говориться в данной статье. Также будут рассмотрены проекты, которые в данный момент развиваются в этой сфере.

Introduction

Lately the humanity thinks about colonization of any planet suitable for life. There are many planets similar to our Earth, which locate outside of Solar system. One of the major challenges is to get to these planets, which will take years. Thereby, we must choose a planet, which is located in the Solar system. Venus is not suitable for life. The average temperature on all surfaces of Venus sometimes exceeds four hundred eighty degrees Celsius, and pressure of the atmospheres is in ninety times more than Terrestrial. The planet is surrounded with the clouds, which almost consist of sulfuric acid and there are often acid rains on planet surfaces. Jupiter does not have surface and almost completely consists of helium and hydrogen and the strongest winds never stop in the atmosphere. The other planets are also not suitable for life, except Mars [1]. Afterwards, in the course of studying of the splinters of the meteorites falling from a surface of Mars to the Ground fossilized remains of microorganisms have been found.

In scientifically fantastic movies and books, colonization of other planets seems idle time. We only need to make the leap into "hyperspace" on your star cruiser, and you punch the put space-time and instantly you arrive to the destination. In reality, it does not look that beautiful. Mankind will colonize the planet by series of small steps, since successful accommodation on low Earth orbit [2].

In order to understand the process of Mars colonization, first of all it should be briefly examined the different phases of activity, which will be necessary to make in transforming the Red Planet. The author has chosen four main phases, which are called "exploration," "base building," "settlement," and "terraforming".

The phase of research of the colonization of Mars was made through telescope reviews. It is necessary to learn resources on the red planet, and the optimum location for the basis and the settlement of people. To determine an operations procedure, which people will be based and by means of what can live on Mars and perform useful operations on essential areas of a surface of Mars.

The following phase is a construction phase. In this phase, we should conduct agricultural, industrial and chemical researches. Thereby, the humanity wants to know if they could turn the Martian raw materials into useful resources. In these missions the question whether it is possible to provide from Martian air, fuel and oxygen in a phase of construction of a basis for colonization are raised. The purpose of this mission is to grow crops on Mars, to be able to make ceramics, metals, plastics and all kinds of other minerals. The initial phase of research can demand small team in number of 4 people working from the base camps widespread in areas of a Martian surface. The phase of construction of a basis will require division of labor. This phase should involve many people. The big team must have lumps of the equipment and have a lump of power supplies for these devices as energy on Mars meanwhile will not manage to be gotten.

If turn out well supports of a considerable part of the population on Mars from local resources, it is possible to begin a phase of settlement of the red planet. This phase will help to create a new human civilization on Mars. Further, by the growing opportunity to transform the Red planet.

However, long-term accommodation in Martian colonies will demand transformation of the planet, so-called terraforming. Terraforming includes a rise in temperature on Mars to terrestrial conditions. The only realistic way to make it — to construct blocks of processing of the soil, which will pump up super greenhouse gases like methane and ammonia in the atmosphere of Mars. These gases will absorb solar energy and to warm the planet, starting emission of carbon dioxide from the soil and polar ice caps. As carbon dioxide increases in the atmosphere, pressure will fall, providing additional heat and formation of the oceans. Eventually the colonists will begin to do without space suits though will be forced to carry oxygen cylinders.

After several decades, later Mars will be almost indistinguishable from Earth. If it will happen, Mars can become the second home for people.

People can't inhale the atmosphere of Mars, which red planet have at this moment. Plants from the Earth could be planted on the surface of Mars to make it possible to create the soil and oxygen. Presence of pressure considerably would bring benefit to human settlers. People will be able to breathe and walk without spacesuits, therefore, it was possible to accelerate to the process of colonization of Mars. In addition, it is necessary to create special structures or buildings for storage and use by people of air from Earth. Such buildings have very big expenses and are not convenient [3].

Among extraterrestrial bodies in our solar system, Mars is unique in this. Red planet possesses all the raw materials required to support not only life, but also a new branch of human civilization. This uniqueness is illustrated most clearly, if we compare Mars and Moon, the most frequently cited alternative location for extraterrestrial human colonization [4].

Difference of Mars from the Moon that it is rich with carbon, nitrogen and oxygen, in all biologically available forms, such as CO₂ gas and gas of nitrogen and so on. These components of the Moon are only present in paucity, also as well as gold in sea water on Earth. Oxygen of course enough on the Moon, but there is a problem that she is in densely connected oxides, such as SiO₂, Fe₂O₃, MgO and Al₂O₃. According to knowledge, which is collected during all the time, scientists have put forward the theory. The theory says that if Mars was smooth and all permafrost, which is present on Mars has thawed and would turn into water, then all planets would be covered by the ocean more than 100 meters from the surface of Mars. This judgment gives plus towards Mars. In order to grow plants on the Moon, it is necessary to import much of our planet Earth.

Also not only metals (or example, copper), and such elements as sulfur and phosphorus are interesting to humanity. While Mars has almost all elements stated above numerous number. On Mars, as well as on Earth, there were hydrological and volcanic processes, which, most likely, will concentrate various elements in local concentrations of quality mineral ore. Judging by mineral resources, it is possible to draw optimistic conclusions. In addition, on the Moon there were no events connected with water or volcanic actions. Because the Moon is made of rocks of garbage with very small difference in ores, which represent useful concentration, something interesting [5].

The most important difference of colonists of Mars from colonists of any other planet, Martian inhabitants will be able to live quietly on a surface. Will not hide from various storms and will be able freely to grow up grain crops on a surface of Mars. Mars is a place where people can increase population and supporting itself by those materials, which are made of local Martian raw materials. Mars is placed where the actual civilization, can be developed not only a scientific outpost and mining industry, but also various fields of activity, which are in the interests of humanity. It is also possible to create interplanetary trade, Mars and Earth - where people will be able to be engaged in export in all fields of activity [6].

Everything that has been described above can be made ideally. However, in reality there will be set of difficulties. It is not enough events on the colonization of Mars.

There is a project called Mars One. It is the private project directed by the Bass Lansdorp and assuming flight to Mars with the subsequent basis of a colony on his surface and broadcast of all events per television. Now the project has already carried out several stages of realization of creation of a colony on Mars. In 2013 the international selection of astronauts has been made. Also in 2015 technical and psychological training of the selected 24 candidates, obtaining skills of a survivor in the isolated environment and in the conditions, which are brought closer to Martian, started.

In addition, there is such project as Inspiration Mars Foundation — the American non-profit organization (fund) founded by Dennis Tito, planning to send in January 2018 the piloted expedition for flight on Mars with return to Earth. In 2013, the Inspiration Mars Foundation fund has held a press conference to announce the plan of fund to provide an equipment, to get services to start on the carrier rocket, to select crew from marrying men and women. Now fund raising, lacking for a start is made.

If to look even more widely and further, then it is possible to consider the project under the name Hundred-Year Starship-the project of NASA and DARPA for preparation of the piloted flight in distant space. The project assumes preparation within hundred next years of the piloted expedition for other star systems [7].

At the moment, "Mars One" project, has the largest commitment to the colonization of Mars than the other projects. Technology development continues, so in the future we might be able to colonize Mars.

REFERENCES

1. Solar System Planets: Order of the 8 (or 9) Planets [Electronic resources] –2016. – URL: <http://www.space.com/16080-solar-system-planets.html>.
2. Will We Ever Colonize Mars? (Op-Ed) [Electronic resources] – 2015 – URL: <http://www.space.com/30679-will-humans-ever-colonize-mars.html>.
3. The Economic Viability of Mars Colonization [Electronic resources] – 2015 – URL: <http://www.aleph.se/Trans/Tech/Space/mars.html>.
4. The cosmic abundances of potassium, uranium, and thorium and the heat balances of the Earth, the Moon, and Mars [Electronic resources] – 1955 – URL: <http://www.pnas.org/content/41/3/127.short>.
5. Colonization of Mars - Wikipedia [Electronic resources] – URL: https://en.wikipedia.org/wiki/Colonization_of_Mars.
6. The colonization of space. Gerard K. O'Neill. Princeton University [Electronic resources] – 1975 – URL: <http://arc.aiaa.org/doi/abs/10.2514/6.1975-2041>.
7. How to colonize Mars [Electronic resources] – 2015 – URL: <https://www.theguardian.com/science/political-science/2015/nov/05/how-to-colonize-mars>.