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HOW THE FLIGHT WAS READIED

By

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How the Flight was Readied

by

V. V. Parin

Only three and one half years **separate us** from October 4 1957, when the Moscow radio announced the beginning of peaceful invasion of the universe. At that day was launched the first man-made Earth satellite. For the first time in the history of humanity created by the ingenuity and labor of soviet people the technical creation reached circular velocity and daringly invaded the spaces of the universe.

The second cosmic velocity (escape velocity), allowing the body to break away from under the clutches of terrestrial gravitation, was also attained for the first time by soviet scientists, engineers, workers. Our country has supplemented the number of ancient planets with the man-made satellite of the Sun.

The creation of powerful and accurately controllable rocket-carriers, ----- capable of taking cosmic ships into orbital flight around the Earth and to other planets, has transferred the eternal dream of men about flying to other planets, from the sphere of fantasy into a world a accurate real calculations. It became clear, that the construction of ships, which will take on people on board, is just a matter of time, not too distant away.

However, if the belief is strong that the technical aspect can be solved, there were still no data on how cosmic flight will reflect itself on the state and health of humans, will he generally be capable of withstanding the numerous perturbations connected with various flight stages.

Until recently among foreign scientists prevailed two points of view regarding the advisability of man's cosmic flight. Advocators of one of these views maintained, than man in the cabin of a cosmic ship will only be an unnecessary burden and a very "brittle" one too. At the time of flight he is in no position of effectively controlling the movement of the ship; and observations of instruments, over the prevailing conditions can be realized successfully by automatically functioning radiotelemetering devices. To provide a person with the necessary conditions, it is necessary to create a number of complex, reliably working technical systems, maintaining constancy of the gaseous composition in the cabin, temperature, specific air humidity etc. All this will complicate the construction and considerably reduce the possibility of equipping the ship with research instruments.

Adherents of the second view assume, that adoption of cosmic space will never be complete, if man does not get there. Sooner or later, and man will fly into the cosmos and will land on other planets. That is why it is necessary to prepare now.

Soviet scientists cling to this point of view from the very beginning of practical exploration of the cosmos. But only several years ago they were not in possession of the necessary data to reply to the question on the possibility and permissibility of man's cosmic flight. The physiologists are now at the threshold of an open door into the unknown, and life has constantly and persistently demanded a quicker answer to many complex problems. An entirely new branch of science came into being - cosmic biology and medicine.

For successful development of science there is one absolutely necessary condition - sequence. In cosmic biology and medicine this sequence is maintained very strictly. It began with stage by stage investigation of the effects of many cosmic flight factors on the organism, which can be reproduced under lab conditions. Thoroughly investigated were all the more complex conditions of flight- from vertical blast offs of rockets to flights on satellites and cosmic ships. Gradually was expanded the circle of investigated biological objects. Cabins of cosmic ships, which were sent into the cosmos

prior to man's flight, as is known, represented a combination of zoo-botanical garden in miniature and biological lab judging by the variety of living substances gathered in it.

Creation within the next several years of radiotelemetering methods of investigating physiological functions - transmission by radio of important characteristics of vital activities of the organism, TV observation of animals at the time of flight, thorough investigation of living substances after their return to Earth- enabled to accumulate extensive scientific material.

What are the results of these experiments? What have the animals encountered and what should man/^{encounter} in his flight into the cosmos?

We will begin with the blast off. First of all, when the cosmic ship breaks away from the Earth and gains the necessary speed to get into orbit, the organism is exposed to considerable accelerations. They produce greater overloads in the organism, which disrupt the course of many vitally important functions and first of all blood circulation. Experiments on animals showed, that at this stage of flight of our soviet cosmic ships the acceleration conditions are such, that the animals develop noticeable adaptive reactions- speed up in heart beat, respiration etc. Not in one of the instances have these reactions attained critical values and they left no irreversible after effects.

At the time of take off the body of the rocket vibrates and there is noise from the power plant. As was established in the experiments with animals, these factors by their intensity are also within limits of bearable boundaries.

After the ship goes into orbit the living substances begin experiencing the state of weightlessness, entirely foreign to inhabitants of the Earth. In laboratory conditions the state of weightlessness cannot be reproduced. When flying on high speed aircraft following Keller's parabolic curve it is possible to attain weightlessness lasting for several tens of seconds, at vertical flights of rockets - lasting up to several minutes.

That is why the problem about the effect of more or less durable weightlessness could be solved only in experiments on cosmic ships-satellites. Radiotelemetering observations of animals at the time of flight and after safe return to Earth showed, that they got accustomed to this unusual state and that the activity of the blood circulation and respiratory organs have not deviated from the norm.

In higher layers of the atmosphere is active cosmic radiation. Physical investigation of the space surrounding the Earth with the aid of satellites yielded in recent years highly interesting and highly valuable results for cosmic biology. On the basis of obtained data it can be assumed, that the greatest danger for living organisms is the ionizing radiation, originating as result of reaction between cosmic radiation and the magnetic field of the Earth. But two bands of this radiation - internal and external - are situated at a considerably greater distance from the Earth, than the altitude of the flight -- orbit of the last ships-satellites. Consequently it was possible to assume, that flights over a selected trajectory are safe for living substances. Of course, these assumptions must be verified in experiments. Long lasting observations of dogs having returned from cosmic flights, observations of laboratory mice, drosophilla flies and other biological objects showed no changes, which could be blamed to the effects of cosmic radiation.

Naturally, that during the time of flight all living substances should be reliably insulated from the surrounding space by an airtight cabin, in which with the aid of special devices is maintained a normal state of air, temperature and humidity. Such devices have been developed and they demonstrates their perfect reliability.

When descending back to Earth there are again the effects of overloads, due to deceleration of the ship. When it enters the dense layers of the atmosphere its walls become heated ^{because} of friction. It is understood, that this is connected with greater dangers. That is why protective things are necessary.

In this way, have been thoroughly investigated various factors, originating at all stages of cosmic flights. These data made it possible for scientists to make a

very important conclusion: the organism of animals endures successfully and without harmful effects the conditions of cosmic flights in orbit. The technical systems of providing living conditions in the cabin of the ship, descending and landing systems function reliably and effectively.

To the order of the day came up the problem of mans flight into the cosmos. The change over to mastering interastral space has been technically prepared and scientifically founded.

Thorough training of the cosmonaut began, training in which many specialists have participated. Scientists developed a scientifically based system of special training, in which main importance was attached to three basic characteristics features. First of all strict sequence of raising the intensity of loads affecting the organism: accelerations , produced on large specially built centrifuges; vibrations, obtained on motor driven vibro stands; duration of remaining in limited in space airtight cabins etc. Secondly, most thorough medicinal control at all phases of special training allowing for the entire time a continuous control over full preservation of man's health. and finally, the intensity of many factors, affecting the organism, was brought up during training stages to values, knowingly exceeding the ones to which the cosmonaut was exposed at the time of flight.

The results speak for themselves. Perfect health of Yuriy Alekseyevich Gagarin, cheerfullness ,workability, his entire remarkable behavior at the time of the historical flight as well as after it have shown that the principles of selecting and training the cosmonaut were correct/and perfectly effective. This has been confirmed by telemetering observations over a series of vital functions of the cosmonaut during all stages of the flight.

Man's first flight into the cosmos - is not only the realization of the eternal dreams of many generations , but an enormous new stage in investigating and mastering the spaces of the universe. From the viewpoint of medicinal science qualitatively new appears to be the fact that objective data about the state of vital functions, obtainable with the aid of radiotelemetring systems, are from now on supplemented

by a more valuable material - personal account of man about his feelings, workability, thoughts, i.e. higher functions inherent of man only.

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