

**INFLUENCE OF SPACE FACTORS
ON PROPERTIES OF MATERIALS AND ORBITAL CONSTRUCTIONS
(«DEGRADATION» PROJECT)**

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Introduction. The purpose of the experiments proposed in the «Degradation» project is to reveal the essential physical processes proceeding in materials and elements of space constructions under long-term exposure to outer space factors. Among such factors the following can be mentioned:

- high vacuum (10^{-7} torr),
- electromagnetic radiation of the Sun including UF-radiation ($\lambda = (5...2500)10^{-9}$ m),
- fluxes of positive protons p^+ and electrons e^- of natural and artificial radiation belts of Earth within the energy range of 30 KeV...10 MeV,
- variation of temperature in the range from 4.2 K up to 450 K,
- strong magnetic fields,
- strong electric fields with the strength of 20...30 kV arising due to the electrification of a space vehicle,
- atomic oxygen, weightlessness, vibration, g-loading, etc.

Simulation of the influence of space factors on the ground usually requires the use of a great number of testing facilities. It means that it is practically impossible to study the entire set of space factors simultaneously. Moreover, the experimental data derived over the last few years on the ground-based simulation of space factors have a substantial disadvantage, as they do not permit any comparison to be made. In addition, simulation of the influence of some space factors on Earth may be even more difficult and expensive than under the conditions of a space flight. For example, about 15000 thermal

cycles may affect a space vehicle during the flight, but only 500 thermal cycles per year were conducted on the ground. Besides, in order to obtain a flux of protons of the necessary magnitude, the experiment should be performed at an atomic power station and so on. Studying the influence of space factors under the space flight conditions, it is also necessary to know the correlation between the accelerated integrated simulation of space flight factors on Earth and the original experiments.

Experiments on degradation of materials and orbital constructions under the influence of space factors will be carried out by the entire international scientific community involved in utilisation of the ISS.

The objectives of the experiments of the «Degradation» project are as follows:

- development of a system («Degradation») of orbital equipment for study of the degradation of materials and elements of constructions of space vehicles under the influence of space factors;
- development of materials, as well as making test specimens and mocks-up for conducting experimental investigations on Earth and during the space flight;
- study of the influence of space factors on degradation of the properties of materials and constructions;
- issuing recommendations to improve the reliability and operational time of a space vehicle in orbit, as well as minimise its weight;
- prediction of normal operation of a space vehicle for the next 5-15 years.