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ANALYSIS OF THE STRAPS AND BUCKLES RATIONAL SCHEME SYSTEM OF SPACE CAPSULE (DESCENT MODULE) SEATS FOR COSMONAUTS/ASTRONAUTS

Abstract

Modern seats of descent module are individual, single-use. They do not take into account the effects of weightlessness on cosmonauts/astronauts, and also reduce the g-load effect in only one direction. Attempts to ensure their reusability are nowadays associated with the rejection of an anthropometric seat liner, which may impair the ability to facilitate the g-load action and increase the risk of injury.

The purpose of this study was to evaluate the significance of the arising loads on the cosmonauts's/astronaut's spine, taking into account affecting factors on it, and to identify possible technical means for mitigating the g-load action on it, including different type and direction.

A model of a deformable one-dimensional spine supported by muscle contractions, cavity pressure, loaded by inertia forces and support reaction was used. The results of calculations of this model are harmonized with the available experimental data.

The obtained results show the advisability of having an individual seat liner with adaptation to the actual form of the cosmonaut's/astronaut's back on the date of use. In this case, it is necessary to rigidly fix the cosmonaut's/astronaut's body to it with minimum gaps, providing support under the g-load effects of any direction, which requires the changes in the fixing means. A fixing method with the fulfillment of these requirements is proposed.

Using the results of the study can increase the safety of the descent module and reduce the harm to the health of the cosmonauts/astronauts from the corresponding g-load effects. In addition, these results can be implemented when creating seats for pilots and passengers of land transport, as well as operator workplaces, reducing fatigue and the risk of injury.