



Title: Solution to the problem of combination of spatial rigidity, stability and compactness in load-carrying shells of challenging space habitats

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Challenging projects of space exploration and, in particular, the projects on organizing the long-time bases on the Moon and Mars surfaces are connected with the need in compact transformation of large-sized objects, which are the base of modular structures and should possess the significant space rigidity, impact resistance and stability to the effect of aggressive space environmental factors (SEF). The mentioned functional properties are necessary for all the known algorithms of deployment of on-planet bases, including also their protection by means of the surface soil (project Moon Village (ESA) etc.), and provided by different methods of the shell strengthening. The main material of the shells can be the soft multilayer armored films of synthetic materials, simplifying the problem of a compact folding; nevertheless, the imparting of spatial rigidity to the structures on their base requires the application of special methods of strengthening, having limited effectiveness.

The vacuum-tight deployable shell structures of thin-sheet metals, suggested by the E.O.Paton Electric Welding Institute (PWI), allow creating load-bearing modules of challenging long-time on-planet constructions, whose required spatial rigidity is guaranteed without creating the excessive inner pressure. High rigid-strength characteristics of similar structures, named as transformable-volume structures (TVS), are combined with mass-dimensional characteristics at the level of known analogs of soft polymeric materials. Up to date there is the experience in the manufacture of metal load-bearing transformable shells with an inner volume of up to 40 m³, capable of changing one of the dimensions by more than 30 times without a local loss of stability.

Biography

Leonid M Lobanov is a professor and deputy director of the E.O. Paton Electric Welding Institute (Kiev), academician of the National Academy of Sciences of Ukraine; he is the author of more than 700 scientific papers and 60 patents. He heads the institute's division, one of the main aims of which is the creation of advanced transformable structures for space techniques.

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