
Experiment-calculated analysis of two types of CFRP structures for large size rocket-space structures

© A.A. Smerdov¹, L.P. Tairova¹, K.P. Baslyk¹, A.V. Artemiev²,
V.A. Nelyub¹, A.S. Borodulin¹

¹Bauman Moscow State Technical University, Moscow, 105005, Russia

²Moscow Aviation Institute (National Research University), Moscow, 125993, Russia

Experimental-theoretic simulation was performed on thermal-force loading of large-size carrier rocket dome. The simulation was performed with the aid of dome fragments. Two structural types were studied, which were produced by various manufacturing processes: (1) a sandwich structure with laminated sheets and a honeycomb core and (2) a multi-wall structure made of carbon fiber reinforced plastic. Theoretical analysis was performed on the load carrying ability of large-size dome shells. Temperature fields were also studied which arose in structural elements under thermal loads varying with time simulating a cyclogram of a rocket flight after its start. Special experimental test bench was used to confirm the load carrying ability of the fragments of sandwich and multiwall panels under simultaneous force and thermal loading in line with an assigned program. The results of the study enabled one to conclude on the potentials of application of each structure type for aero-space engineering.

Keywords: *experimental modeling, calculation, theoretic analysis, sections and dome of a carrier rocket, multiwall shell, sandwich shell, cfrp, strength, heating.*

Smerdov A.A. graduated from Bauman Moscow Higher Technical School in 1981. Dr. Sci. (Eng.), Professor of the Spacecrafts and Launch Vehicles Department of Bauman Moscow State Technical University. Author of 101 papers in the field of optimal design of composite structures. e-mail: asmerdov@mail.ru

Tairova L.P. graduated from Bauman Moscow Higher Technical School in 1972. Ph.D., Senior Researcher of the Research Institute for Special Mechanical Engineering at Bauman Moscow State Technical University, Assoc. Professor of the Spacecrafts and Launch Vehicles Department and of the Rocket and Space Composite Structures Department of Bauman University. Author of more than 80 publications in the field of experimental study and design of composite materials and composite structures. e-mail: comor@yandex.ru

Baslyk K.P. graduated from Bauman Moscow State Technical University in 1994. Ph.D., Assoc. Professor of the Spacecrafts and Launch Vehicles Department of Bauman Moscow State Technical University. Author of 15 publications in the field of mechanics and computation of composite materials and structures. e-mail: kbaslyk@gmail.com

Artemiev A.V. graduated from Moscow Aviation Institute in 1981. Senior Lecturer of the 104 Department of Moscow Aviation Institute. He works in the field of production techniques for composite structures. e-mail: andart61@gmail.com

Nelyub V.A. graduated from Bauman Moscow State Technical University in 2006. Director of the Engineering Scientific-Educational Center «New Materials, Composites and Nano-Technologies» of Bauman University. He works in the field of production techniques for composite structures. e-mail: mail@emtc.ru

Borodulin A.S. graduated from Bauman Moscow State Technical University in 2007. Vice director of the Engineering Scientific-Educational Center «New Materials, Composites and Nano-Technologies» of Bauman University. He works in the field of production techniques for composite structures. e-mail: asb@emtc.ru