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Abstract

A method for calculating thermal stressed state of laminated glazing elements of aircrafts sources is offered. Glazing element is considered as a constant thickness non-closed cylindrical laminated shell when exposed to interlayer film heat sources. The number of layers and their layout and physical properties are arbitrary. Convective heat exchange occurs on the shell surfaces. The temperature influences have been obtained by solving the nonstationary heat conduction problem. Deformation of the shells is considered on the basis of the refined theory of the first-order accounting transverse shear strains in each layer. The problem solution is built in analytical form by the embedding method. According to the method, the complex-shape shell is virtually embedded within an auxiliary enveloping laminated cylindrical non-closed simply supported shell of rectangular planform shape with the same composition of layers. An auxiliary shell is one whose contour shape and boundary conditions yield a simple analytical solution. The thermal stresses in five-layer aircraft elements have been investigated. The results were validated by comparison with test data. The method suggested can be used for designing heating systems and determining temperature stresses in the laminated glazing of different transport vehicles.

Keywords: Laminated shell, Heat source, Thermoelasticity