

TO DESIGN AND ANALYSIS OF SOME THIN-WALLED STRUCTURES

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Based on investigations [1], we discuss the following results:

1. In the nonlinear dynamic equations of von Kármán type term a member describing wave propagation in the longitudinal direction usually is absent. The influence of this term can be proved to be very important at the description of behaviour of wings and tail parts of aircraft construction. Analogous phenomenon holds in the static problems too. Introduction of the corresponding needed terms eliminates the well-known problem of “Physical Soundness” in Truesdell’s sense.

2. The corrections, introduced according to the proposed theory, in the average boundary conditions, consist in a refinement of the influence of boundary layer. It can cause significant changes in the neighbourhood of cuts (porthole, doors and etc.). Introduction of this term also explains and resolves set of paradoxes usually characteristic of existing refined theories (e.g. Kirchhoff, von Kármán, Mindlin, Reissner and all others).

3. Using [2], there are refined theories constructed for the thermo-dynamic elastic TWS when the governing equation with respect to thermal member is nonlinear and contains its second order derivative with respect to time.

4. We consider also the problem of mathematical modelling of thermo-dynamic elastic non-shallow shells by 2D von Kármán-Koiter-Ciarlet type refined theories. The statical part of corresponding models represents boundary value problems for nonlinear systems of 2D partial integro-differential equations with Monge-Ampere operators and Poisson brackets. As a typical example we consider some details when shells present longitudinal TWS tube. In this problem, some schemes of the applied theory of analytical functions and a projective method will be given.

References

1. Vashakmadze T.S.: The Theory of Anisotropic Elastic Plates. (Kluwer Academic 1999), Springer-Science+Business Media B.V., Reprint (256p.), 2010.
2. Vashakmadze T.S.: To Some Problems for Thermo-dynamic Elastic Multilayer Thin-walled Structure. Conference’s Proceedings, TICCSAM-2015, Tbilisi: 161-173, 2015.