Paper ID: 17474
oral

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures - Dynamics and Microdynamics (3)

Author: Prof. Anatoliy Alpatov
Institute of Technical Mechanics of the National Academy of Science and State Space Agency of Ukraine, Ukraine

Dr. Vjacheslav Gusynin
State Space Agency of Ukraine (SSAU), Ukraine
Dr. Pavel Belonozhko
Institute Of Technical Mechanics of National Academy Of Sciences Of Ukraine and State Space Agency Of Ukraine, Ukraine
Dr. Serhii Khoroshylov
Institute Of Technical Mechanics of National Academy Of Sciences Of Ukraine and State Space Agency Of Ukraine, Ukraine
Dr. Alexandr Fokov
Institute Of Technical Mechanics of National Academy Of Sciences Of Ukraine and State Space Agency Of Ukraine, Ukraine

CONFIGURATION MODELLING OF CABLE-STAYED SPACE REFLECTORS

Abstract

The large cable-stayed space reflectors were considered in the paper [1]. In this paper the main structural features were identified, research problems were formulated in relation to the shape control of the reflecting surface and various mathematical models for shape-building were proposed. The present paper represents results of configuration modelling of the cable-stayed space reflectors obtained by using the separation principle for independent substructure of support frame (flat shape-building elements) which was proposed in [1]. The approach based on the continuum mechanical design model of shape-building element was developed. The assumption that the length of any components of the meridional chain of rod frame is small in comparison with the total chain length allows to represent shape-building element as a flexible stretchable thread with distributed load. The transformation from discrete design model which was described in [1] to the continuous one allows to get analytical form patterns to characterize the process of shape-building of a cable-stayed space reflector. The differential equations taking into account horizontal displacement of the thread points in transition from its initial position to the nominal one are obtained for the shape-building element equilibrium. The perturbed state equations in deviations from the nominal configuration are derived. The implementation features of the shape-building load are considered. The results can be used to design this type of reflectors and create both passive and active systems for shape control of the reflecting surface.

1. Shape control of large reflecting structures in space / A.P. Alpatov, V.P. Gusynin, P.P. Byelonozhko, S.V. Khoroshilov, A.A. Fokov // IAC-11.C2.3.6