

## STABILITY OF ELASTIC VIBRATIONS FLIGHT VEHICLE WITH CONTROL SYSTEM

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One of the important applications of dynamic aeroelasticity is the study of oscillations in the contour, which includes an elastic flight vehicle (FV), and automatic control system (CS). The main task - to ensure the stability of oscillations in aeroelastic interaction of FV and CS in flight, it is considered in relation to highly maneuverable guided FV.

The immediate objectives of the study are to determine the boundaries of possible self-oscillations and assessment of their level, and develop, if necessary, means to prevent them from providing the required stability margins.

To do this calculation and the experimental studies used frequency methods with the "frozen coefficients", while the variant of loop FV CS with analog signals of the angular velocity.

Stability analysis of transverse vibrations of single-contour system is carried out taking into account the interaction between channels. Due to the nonlinear characteristics of body's stiffness and damping, the availability of its "internal" resonances, there is a dependence of the amplitude-phase frequency characteristics (APFC) with the amplitude of the oscillation. Basic data related to testing of aircraft with different masses.

Essentially non-linear characteristics of the CS, in particular the actuators, as well as FV body, are determined experimentally at different levels. By method of harmonic linearization allocated individual units APFC of the stabilization contour of FV at its elastic vibrations frequencies.

Permissibility of the use of harmonic linearization is based on the properties of elastic-mass characteristics of the aircraft body that filters the higher harmonics. Primary means of ensuring an adequate supply stability of contour FV-CS is the appropriate configuration settings corrective filters

An additional research tool is an electromechanical simulation of aerodynamic forces (EMM). In the measurements with an artificial "airflow" can be realized the problems with open-and closed-loop of CS.

The advantage of EMM - the possibility of simulating flight conditions on full-scale FV with a functioning automatic control system without any fundamental restrictions on the modes of testing, duration and amount.