DOCUMENTATION SHEET

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Title : **A THEORETICAL FORMULATION FOR FLUTTER ANALYSIS OF A TYPICAL SUBSONIC AIRCRAFT WING (SARAS) USING QUASI-STEADY AERODYNAMIC THEORY**

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Abstract:

A theoretical formulation for flutter analysis has been utilized to develop a working method for determining flutter speed of a typical subsonic wing (SARAS). A Galerkin type of analysis has been used to derive the matrix form of equations from the differential equations of motion of the subsonic wing. Quasi-steady aerodynamic theory has been used to model the aerodynamic forces. A computer code in FORTRAN has been prepared for generation of matrices while the eigenvalue analysis is performed through MATLAB. The code is benchmarked through the solution of flutter of a rectangular wing. The results from the code agree reasonably with those obtained from the industrial code NASTRAN.

The method is then extended to the flutter analysis of the actual "clean" wing of SARAS, with no control surface effects. The tapered wing is modeled as a stepped assembly of constant section beam elements. Results indicate that the SARAS wing is very stiff and therefore is not flutter prone at all in the subsonic regime. To simulate subsonic flutter conditions, a hypothetically reduced stiffness analysis is performed.

In all the cases, the agreement of the results with those of NASTRAN (that uses the Doublet Lattice Method, DLM) indicates the validity of the present method of analysis using the quasi-steady aerodynamic theory. The present work can be extended to study more complicated cases of flutter in SARAS wing with control surface effects and SARAS T-Tail assembly which are expectedly quite prone to subsonic flutter.