

LECTURE 1

TURBOMACHINERY FLUTTER-INTRODUCTORY CONCEPTS

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INTRODUCTION

The object of this and the next two lectures is to acquaint the reader with several turbomachinery flutter problems confronting the design engineer and to suggest some of the ways in which the designer can cope with these problems. It is obvious that an in-depth examination of the problem is beyond the scope of the present lectures, and the reader will be directed to the available literature for more details. Nevertheless, an attempt will be made to approach this exposition from the point of view of the designer and the application of theoretical or empirical methods to overcome design barriers will be stressed wherever possible.

To achieve this end the reader will first be exposed to the basic differences between wing flutter and turbomachinery blade flutter. This will be helpful in establishing the areas in which elementary theories can be used to explain basic principles, and will also point up the need for advanced theories. Following this, in the second lecture, the most prominent flutter problems facing the designer will be discussed. These range from subsonic stall flutter to supersonic coupled flutter. Finally, in the third lecture, several advanced unsteady aerodynamic theories will be briefly discussed and their application to real problems will be examined.