Book Reviews

Turbulent Shear-Layer/Shock Wave Interactions,

J. Délery, Editor, Springer-Verlag, Inc., New York, 1986, 430 pp., $75.90.

Shock waves and shear layers, two of the most incompatible of all fluid phenomena, unfortunately meet in a variety of important aerospace applicatons. The results are often extremely difficult to understand, predict, or control. After years of evolutionary research, although our overall grasp of the problem is still spotty and sophomoric, we have gained some significant knowledge.

That knowledge is apparent in this volume, which contains the Proceedings of the 1985 IUTAM Symposium on Turbulent Shear-Layer/Shock Wave Interactions. Its contents, consisting primarily of original research papers, are well organized by editor Jean Délery, himself a noted contributor in the field.

Most of the 32 papers in the volume concern interactions of shock waves and turbulent boundary layers. This emphasis reflects the importance of such interactions, for example, in limiting the cruise speed of current jet transports. However, only a few of these papers deal directly with aircraft aerodynamics. Most are basic research studies aimed at a better understanding of the problem.

The "problem" is, in fact, many problems. Shock/boundary-layer interactions vary widely in their characteristics, depending on such parameters as Mach number, shock strength, and degree of three-dimensionality. The latter parameter is the basis for the organization of contents of the volume. Roughly two-thirds of the papers concern two-dimensional interactions, an idealization that may not actually occur in nature, but is nonetheless convenient for study.

The international flavor of the Symposium is reflected in contributions by United States, French, British, German, and Japanese authors. The Soviet Union, known to be interested and active in this field, sent observers but did not otherwise participate.

The volume also reflects the emergence of computational fluid dynamics as an important issue in this field. Several papers report the results of Navier-Stokes solutions employing various turbulence models and requiring hours of time on the largest computers available. Shock-wave/shear-layer interactions are not so easily predicted in this way as are many low-speed flows, but the results do show promise. Perhaps because of their difficulty, interaction problems have become pacing items for the latest CFD algorithms and turbulence models.

Theoretical analyses of several types are also well represented in the volume. Together, CFD and analytical papers comprise about half the contents. The remainder is devoted to experiments that, as the traditional means of generating new knowledge about complex flows, are still the mainstay of this research area.

Of special note is a group of five papers on the unsteady aspects of interaction phenomena. Two of these concern the basic shock/turbulence interaction mechanism, which is an issue of current practical importance in supersonic combustion for high-speed propulsion, as well as in the aeroacoustics of helicopters. This section of the volume is headed by a competent review of unsteadiness in shock/boundary-layer interactions by D. S. Dolling. The two other review papers in the volume concern turbulence modeling and three-dimensional interactions.

In summary, this volume is an important collection of recent detailed research on the shock-wave/shear-layer interaction problem. It is not recommended as immediate reading for the newcomer to this field but should definitely be acquired by active researchers and technical libraries.

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Transsonishce Turbomaschinen (in German)

A. Bölcs and P. Suter, G. Braun Karlsruhe Publishing, West Germany, 1986, 373 pp., DM 49.80.

This book was developed from lectures given by Professors Bölcs and Suter at the technical universities of Lausanne and Zurich. It is the authors' objective to provide an introduction to transonic turbomachinery aerodynamics and aeroelasticity for engineering students and for practicing engineers.

In the first chapter the reasons for transonic stages in steam turbines, industrial gas turbines, and compressors as well as in-flight propulsion systems are explained. The second and third chapters present the gasdynamic fundamentals, including the method of characteristics, and the transonic phenomena occurring on single airfoils. In the fourth and fifth chapters transonic inviscid compressor and turbine cascade flows are discussed. The sixth chapter is devoted to the viscous phenomena and losses occurring in cascades. In chapter 7 the unsteady rotor-stator