of the assumptions behind the various sets of equations by having these collected and listed for him.

Each of the stability derivatives contained in the general equations of motion is discussed next. Formulae for their evaluation are given or, where this is not possible, the qualitative dependence of the derivative on the perturbation quantity is described. Three appendixes give about sixty pages of formulae, tables and graphs relevant to stability derivatives, the standard atmosphere, mean aerodynamic chord and centre, etc. The data quoted are taken mainly from the National Advisory Committee for Aeronautics Reports and Royal Aeronautical Society Data Sheets. The National Advisory Committee for Aeronautics notation of stability derivative is used throughout the book. The author directs attention to certain differences in definitions used in Great Britain and the United States.

In successive chapters the stability of small perturbations in the longitudinal and the lateral motions is analysed using the differential form of the equations of motion. Since the subject-matter of the remainder of the book can only be treated fully by the use of mathematical techniques based on Laplace transforms, frequency responses and random functions, a chapter is devoted to an explanation of these techniques. The Laplace transform and frequency response-approach is then used to study the response of the aircraft to actuation of its control surfaces.

The next topic to be treated is that of flight in turbulent air, and here the approach is centred on analysis in terms of the power spectrum of the turbulence.

On the assumption that the aircraft motion is known, there may be occasion to determine (a) the input action, given the aircraft parameters, or (b) the aircraft parameters given the input action. A chapter is devoted to such inverse problems. This is a topic of considerable practical interest and the value of the short outline given would have been greater had some notes been included on some of the practical difficulties involved.

The last three chapters give the reader an outline of up-to-date applications and techniques by discussing in turn, automatic stability and control by means of feed-back devices, specialization to missiles, and finally the fundamentals of machine computation and simulation. These chapters are brief but nevertheless valuable introductions to very large subjects. This is a carefully prepared and well-presented book which covers a very wide field in a very competent manner.

REFERENCE BOOK OF THEORETICAL PHYSICS

Manual of Mathematical Physics

By Paul I. Richards. Pp. xi+486. (London and New York: Pergamon Press, 1959.) 110s. net.

THE author states in his preface: "The goal of this book is to condense established theoretical physics, its applications and its mathematical equipment into a single reference volume of reasonable size without sacrificing either logical continuity or fundamentals".

This seems to be a hopeless attempt. The book has, however, a distinguished German predecessor. "Die

mathematischen Hilfsmittel des Physikers", by E. Madelung, is a collection of formulae and theorems concerning a wide field of advanced topics in theoretical physics which for four decades has been of invaluable assistance to research workers. The influence of Madelung's work on the present book is obvious and beneficial, but emphasis is now shifted to some extent from formulae to verbal argument.

A 'physics' section covers classical mechanics, electrodynamics and optics; thermodynamics and statistical physics; relativity and the quantum theory of matter and radiation. Both the general principles of the theories and their applications to special problems are taken into account. In addition a number of recent branches of theories are included, and circuit theory and other subjects of technological importance are added. A 'mathematics' section deals with the calculus, complex functions, series expansions and differential equations; integral equations and Hilbert spaces; modern algebra, vectors and tensors; numerical methods, probability and linear programming, to name the most important headings.

It need scarcely be said that the accommodation of this vast amount of material is possible only by very concise wording. This obviously renders the volume unintelligible to all but fairly expert readers. The value of the book should accordingly be assessed by its possible use to competent research workers.

This use is unfortunately somewhat limited because the presentation of the subject does not conform with the author's claim in the preface. The 'physics' section does not show much logical continuity; rather it would appear to be an assemblage of unconnected and incomplete statements. The shortage of space does not prevent the author from indulging in unnecessary verbosity whereby significant points in explanations are lost.

The 'mathematics' section is on the whole better presented, but is burdened by numerous formulae the origins, applicability and significance of which are not given. 1,200 words are used for the subsection 'signal flow diagrams', which appears to be a method for solving simultaneous equations. I was unable to derive from the text any instruction for operating by this method; nor is there any result shown from which the principles of this method could be inferred. Contour integration is dealt with in 100 words, no result or example being presented. The Lebesgue integral is discussed in 250 words—which should be sufficient for a book of this kind—but no definition of that concept is included. There is an adequate table of Laplace transforms, but no corresponding table of Fourier transforms. These examples may show that also the 'mathematics' section is of limited use only.

So far as the verbal text is concerned the book is scarcely any better than a list of technical terms of theoretical physics and applied mathematics. This shortcoming is all the more surprising as the author repeatedly shows that he has mastered the subject and would be capable of saying much in few words. Presumably he believes that his source book is of interest to some class of readers, whoever they may be.

If the book is regarded as a collection of formulae it may still be useful to research workers. They may save appreciable time and effort if a formula can be found in the present volume and need not be searched for in some treatise.

R. EISENSCHITZ