broadband elements such as flared notch, tapered slot, Vivaldi type and capacitively coupled dipole elements making reference to traditional as well as to more recent designs providing an excellent starting point to the antenna designer.

The following chapters deal with more specialised topics of phased array antenna technology. Chapter 6 deals with mutual impedance effects due to element coupling and the problem of scan blindness. Chapter 7 addresses error effects such as amplitude and phase excitation errors and quantisation on the performance of the array in terms of sidelobe levels, beam pointing error and directivity variation. Chapter 8 presents multiple beam antennas including lens and reflector systems and reflect arrays. Finally, Chapter 9 addresses specialised arrays such as arrays for limited field of view and wideband arrays and addresses the complexity of the control and feed systems of the arrays.

Robert J. Mailloux is a world known authority in phased array technology and this book is without doubt an invaluable addition to the library of everyone working in the field.

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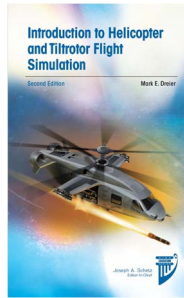
Introduction to Helicopter and Tiltrotor Flight Simulation – Second edition

M. E. Dreier

This is one of the renowned series of books published by the AIAA and is a revised edition. It is a large tome consisting of 740 pages and is hardback. There is also a considerable amount of supporting materials available from the AIAA web site. Full details of access are available from the book.

The quantity of material is a testament to the difficulties arising from rotary wing aircraft study. There are many topics to be examined but the crunch point is always the close interaction between these disciplines.

After the introduction, there are two preparatory chapters on vectors and axis systems. With the rotations involved in rotary wing, understanding of these concepts is very important. The book then moves onto the application of these various concepts to helicopters.

The text then develops the subject of aerodynamics. It begins with a description of modelling the atmosphere followed by analysing the aerodynamic forces on typical shapes found with fuselages. The chapters then become larger as the focus moves towards aerofoils, wings, fins and propellers.

As with all things rotary, aerodynamics must be accompanied by a study of rotor dynamics. This is visited before a detailed view of rotor aerodynamics is undertaken including the subject of rotor downwash. The following chapter examines what is termed special interest modelling. These comprise topics such as autorotation and rotor droop which heralds the later chapter on engines. Rotor dynamics has already been considered but now the focus moves onto rotor aeroelasticity and interference. Engines are now considered in detail and the part of the aircraft that connects both rotor and engines, namely the transmission. Controlling the aircraft is particularly involved for this type of aircraft so has a detailed chapter devoted to it. Both helicopters and tiltrotors have to operate in a wide range of situations and the ability of the undercarriage to handle these conditions is discussed next.

The final two main chapters consider the ways in which the determining the trimmed state of an airframe can be achieved and how to assemble all of the preceding discussions into a complete description of how to make each aspect of these fit together into a full blown set of design calculations.

The final part of the book is a series of Appendices each describing engineering and mathematical processes that someone using this book will encounter. These are really useful to have handy.

The book, particularly the final chapters, makes a number of references to supporting documentation and software code. MATLAB® is the main package considered which is not surprising considering its universal usage.

There is no doubt that the design of a rotary wing aircraft is grasping a bull by the horns. The size of this animal is reflected in the size of this book. In reviewing it, I spent a number of days reading it through in the normal way. To make more use of it, I would think of it as something to dip into and read the most relevant chapters as required. It has an enormous amount of material and if I am given two small grouses, it is not seeing ground resonance in the index (it is something that has to be avoided which puts certain requirements on the rotor design and also that of the undercarriage) and a few of the photographic figures are rather indistinct.

However, it is a wealth of information interspersed with little bon mots born of experience. Not for the faint hearted but a valuable book to have on your shelf.

Dr Simon Newman, CEng, FRAeS