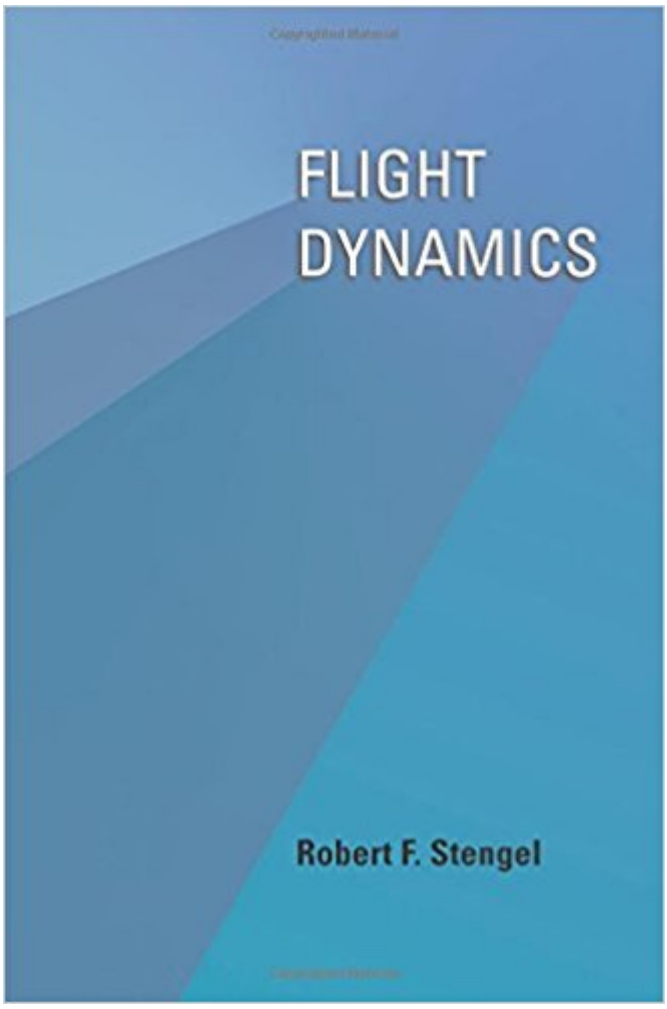
Flight Dynamics



Synopsis

Flight Dynamics takes a new approach to the science and mathematics of aircraft flight, unifying principles of aeronautics with contemporary systems analysis. While presenting traditional material that is critical to understanding aircraft motions, it does so in the context of modern computational tools and multivariable methods. Robert Stengel devotes particular attention to models and techniques that are appropriate for analysis, simulation, evaluation of flying qualities, and control system design. He establishes bridges to classical analysis and results, and explores new territory that was treated only inferentially in earlier books. This book combines a highly accessible style of presentation with contents that will appeal to graduate students and to professionals already familiar with basic flight dynamics. Dynamic analysis has changed dramatically in recent decades, with the introduction of powerful personal computers and scientific programming languages. Analysis programs have become so pervasive that it can be assumed that all students and practicing engineers working on aircraft flight dynamics have access to them. Therefore, this book presents the principles, derivations, and equations of flight dynamics with frequent reference to MATLAB functions and examples. By using common notation and not assuming a strong background in aeronautics, Flight Dynamics will engage a wide variety of readers. Introductions to aerodynamics, propulsion, structures, flying qualities, flight control, and the atmospheric and gravitational environment accompany the development of the aircraft's dynamic equations.

Book Information

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Customer Reviews

"[A] tour de force of a text. . . . This is an ambitious and important work. . . . As the very latest of this genre, Prof. Stengel’s hefty volume brings the material up to the minute, tackles more topics with more depth, buttresses its analysis with MATLAB examples, and still does a superb job of stimulating and informing the reader. . . . [I]ts push toward computational synthesis does open a new door for this type of text."--John Hodgkinson, AIAA Journal"This book provides a significant addition to the existing literature on flight mechanics. It deserves to be part of the library of scholars and practicing flight mechanics engineers alike. The use of this text in an undergraduate course would require skilled care but would provide a valuable resource to its owner well past graduation."--Eric Feron, IEEE Control Systems

"A monumental piece of work. Its comprehensive treatment of flight dynamics makes it the broadest in its class and constitutes a major contribution to the aerospace community. Destined for students’ shelves as well as mine, it will also be valuable as the methodological companion to the aircraft designer, flight test engineer, and pilot."--Eric Feron, Massachusetts Institute of Technology "This book is definitely a significant contribution to the field. It is more comprehensive than any other work on flight dynamics I have seen; it includes newer concepts, such as neural nets and wind shear effects, some of these reflecting the author’s own research; and it gives a very broad view of flight dynamics. Not only is it a fine textbook on flight dynamics, but it is so thorough and so well written that it will undoubtedly catch the attention of practicing engineers and airplane enthusiasts."--Haim Baruh, Rutgers University

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Originally bought this book for a Flight Dynamics course in college, but these days I’m working in the aerospace industry and it has proven an invaluable reference again and again. Superb development and explanation of a fundamental aircraft dynamics model, followed by in-depth analysis of the revealed modes of motion; this book is a tremendous resource for anyone interested

or involved with aircraft.

Item delivered quickly and as described.Could have been packed better -- a bit of a dent on one corner.USPS flat rate boxes provide plenty of room for safe packing. Padded envelopes are not a very good way to pack books.

This is Stengel’s contribution to the flight dynamics literature with some emphasis on controls. There are things I like about this book and things I do not like about this book. First, I like his statement and treatment of the equations of motion and the engineering and physics of flight and its control. The only problem I have with those parts of the book is that the Euler angle and quaternion sections have clearly been written by someone who has never had to actually use them in a simulation etc. The equations are, however, as far as I can tell correct. But the student/engineer will have to do some digging to get what they need. Second, there is an awful lot of good information in this book and it provides pretty much an all in one reference book for flight dynamics. Most of it is very readable.Now for the parts I don’t like. First, with just a little effort this book could have covered missiles as well as airplanes (just like Blakelock). This is not a big sin and is very popular though. Second, Stengel’s treatment of the flight coefficients in the stability frame are strange and do not seem to follow the standard conventions. They are correct but the normalized approach developed by NACA and propounded by Blakelock led directly to servomotor design. There is an additional step in Stengel’s approach. Several of his frames of reference seem to suffer from similar maladies. There is nothing wrong with this of course but it may be that he was so busy trying to leave his own mark that he did in fact neglect several aviation traditions in this domain. He does mention the old DATCOM work but one can not directly use DATCOM from his book without first doing some more work. Third, many of the most advanced concepts are glossed over or just touched upon. This is being sold as a textbook but it is really more of a treatise (a not uncommon identity crisis these days). Neural networks, modern controller designs, and others are just pranced over. The literature is cited however and of course one can just go look it up. A little more depth in some areas would have been appreciated, however. Fourth, evidently we can’t have a book on flight dynamics without singing odes to lqr and lqg. These methods are popular with the state space crowd since normally there is no clearcut relationship between eigenvalue placement and phase margin. lqr in some of its incarnations is known to have excellent phase margin properties ranging as high as infinity. This is perfect impementation of course and lqg is standing by to solve that issue. These methods have their place in the control engineers arsenal but to use lar/lqg to establish the basic flight path of the

aircraft with the pilots inputs just used to make small trim changes about that direction probably violates the current trend towards 100% control authority for at least some types of aircraft and the pilot needs to retain at least enough to be able to handle problems. When these idealistic problems are solved the lqr/lqg controller methods begin to look more like current controller designs.Anyhow, this is an excellent book that any flight controls or aviation engineer will find more than just useful. It provides a pretty complete treatment of the state variable approach and should serve as an excellent starting point for those wanting to design actual controllers for aircraft.

Verbose and dry treatment of flight dynamics. Book is dull to read, and author spends most of his time throwing equations at the reader. Non-learning friendly! Sold back as soon as I was done with my flight dynamics course.

Good