



**GEORGE H. SAUNDERS**

**DYNAMICS OF  
HELICOPTER  
FLIGHT**

## PREFACE

This book is intended to fill the large gap in the existing helicopter literature between elementary manuals on “How-to-Fly-a-Helicopter” and the few advanced engineering texts on helicopter design. The former are replete with oversimplifications and homey analogies that do not provide the fundamentals for analyzing current problems. The latter are equally unhelpful in that they resort to, and often hide behind, complex mathematical descriptions.

The book is written for the intelligent pilot and for the engineering student who has had little previous exposure to the topic. It blends a theoretical treatment with the wisdom of experimental evidence and operational experience. Mathematics is used to the level of high school algebra, and then only to illustrate important quantitative relationships. A rudimentary acquaintance with the basic concepts of physics, especially mechanics, will be helpful to the reader; however, the most important of these are reviewed in Chapter 1.

Some basic concepts of the generation of aerodynamic forces are considered in Chapter 2 before applying these concepts to the particular case of an entire rotor system. Chapters 3 and 4 analyze in some detail the generation of lift, drag, torque, and power in hover and forward flight and relate these parameters to how and why the helicopter performs the way it does.

Perhaps the least understood subject is the stability (or lack of it) and the control of modern helicopters. What effects are present, and what role do they play in the sometimes peculiar motions helicopters exhibit about their pitch, roll, and yaw axes? This is the subject of Chapter 5 and includes the rapidly advancing application of stability augmentation concepts to helicopters.

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