

# BOOK REVIEW

**Fluid-Dynamic Drag** By Dr. Ing. S. F. Hoerner; Published by and obtainable only from the author at 148 Busted, Midland Park, N.J.; \$14.50.

The new book, *Fluid-Dynamic Drag*, in this writer's opinion is the most complete and useful text available on this subject. In superceding his earlier book of 1951, *Aerodynamic Drag*, Dr. Hoerner has done much more than add new chapters on Land Structures, Water Vehicles, and Supersonics. The subsonic aircraft portion has also been reworked and much new material added. The size, printing quality, and readability of the illustrations has been greatly improved.

Dr. Hoerner combines a sound theoretical background, a personal contact with a large portion of the history of hydrodynamic development, and a knowledge of the requirements of the practical engineer working on pressing problems to an extent unapproached in any other individual known to this writer. Even though the book is readable and useful in providing answers to practical problems it must not be assumed that it is merely an empirical handbook. The serious student of fluid dynamics will find all the basic flow phenomena clearly expressed and much food for thought is provided those who would extend the state of knowledge so well summarized here. The 2000 references from all countries, including Russia, have been gathered by Dr. Hoerner in a lifetime of work. The 600 illustrations aid immeasurably in the presentation.

Two thirds of the 400 page, 8 by 11 inch book is devoted to subsonic flow and almost half of the book is directly applicable to drag prediction for sailplanes. Chapter 1—General Information—explains with crystal clarity the few engineering concepts needed to apply the remainder of the book. It appears to the writer that Dr. Hoerner must have had in mind that individual so common in our Soaring Society (the performance enthusiast without formal engineering training) when he prepared this wonderful text. Chapter 2—Skin Friction—is of prime importance since the sailplane drag at zero lift can, with proper design, consist almost entirely of this type of drag. Chapter 3—Pressure Drag—will provide an understanding of the cost of blunt objects and why

they have no place on a high-performance sailplane. Chapter 5—Surface Irregularities—deals with surface graininess, protuberances, and control surface gaps in turbulent boundary layers such as exist on the rear portions of wings and tails and over most of the fuselage of a sailplane. The chapters thus far may be considered fundamental background and the intelligence with which one applies the specific data from later chapters will be a function of the reader's mastery of this first portion.

Chapter 6—Streamline Shapes—deals with wings, tails, struts and bodies, and points up the importance of Reynolds Number. Typical operating Reynolds Numbers are presented for everything from butterflies to bombers. The very low increase of drag with thickness ratio increase for laminar airfoils is pointed out here. Chapter 7—Drag Due to Lift—discusses many second order effects not usually covered in books on this subject. Some interesting data on birds and formation flying is included. Chapter 8—Interference Drag—is of prime importance for certain practical problems the sailplane designer must face. Data are provided for the relative drag sensitivity of protuberances at various locations on the airframe. Wing-body, tail intersection and canopy problems are treated.

Chapter 13—Aircraft Components—contains information useful to the sailplane designer on dive brakes, elevator deflection and semi-protuding faired and unfaired wheels. Chapter 14—Complete Aircraft—gives a fascinating complete drag breakdown on the Me-109 fighter. It is interesting to note that 48% of the total drag comes from surface roughness, imperfections and exposed minor parts. Of course sailplanes are not cursed with all the problems of the powered airplane, but attention to detail can provide significant improvements in performance. This chapter also presents a breakdown on the drag increase at high lift coefficients which should be considered in detailed sailplane performance prediction. The polar curve for Lippisch's Sao Paulo is presented and comments made on the conditions for maximum glide ratio and minimum sinking speed.

The foregoing chapters deal with subsonic aircraft drag. The reader

will have difficulty stopping at this point, however. We skipped over Chapter 4—Wind Forces on Structures—Will that hangar roof stay on in a Texas Norther? Chapter 9—Internal Flow Systems—Is that poor old towplane overheating? and How much performance will I lose through cabin ventilation? Chapter 10—Hydrodynamic Drag—and Chapter 11—Water-Borne Vehicles—The family may someday force you to sell your sailplane and take up boating. Chapter 12—Land-Borne Vehicles—Is that glider trailer cutting into your gas milage on those 400 mile retrieves? The remaining third of the book, while not directly applicable to the problems of the soaring enthusiasts, will provide additional education in modern trends in flight.

The price of \$14.50 may be more than one is accustomed to pay for a single book but it should be remembered that this is a complete treatment of the subject and could only be compared to the 2000 references from whence it came. To compile, compare, analyse, correlate and present this volume of data in clear, concise form is the dedicated lifetime work of a rare and talented engineer. Engineers for generations to come will read with pleasure and amazement this outstanding contribution of Dr. Sighard Hoerner.

BRUCE H. CARMICHAEL  
Chairman, SSA Aero-  
dynamics Subcommittee

## EAA EXPERIMENTAL AIRCRAFT ASSOCIATION

A non-profit organization dedicated to the advancement of home-built aircraft and private aviation.

### ANNUAL MEMBERSHIP DUES:

Member . . . . . \$10.00  
Junior Member . . . . . \$ 5.00  
(less than age 19)

Subscription to  
"Sport Aviation" . . . \$ 5.00

Member grades include subscription to monthly EAA magazine "Sport Aviation" and receive the Amateur Builder's Manual.

## EXPERIMENTAL AIRCRAFT ASSOCIATION

9711 West Forest Park Drive  
Hales Corners, Wisconsin