Book Review

Atmospheric Gravity Waves and Soaring Flight:
Physical principles and practical applications

by Dieter Etling
118 pages, DIN A4
Photos, diagrams, bibliography
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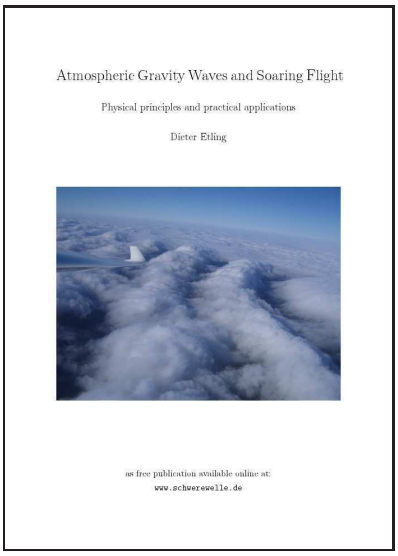
Available at no charge at `www.schwerewelle.de/literatur`

Reviewed by Ward Hindman



If you want to recognize, understand and predict the atmospheric waves that enable soaring flight, then Dieter Etling's book is for you. It is written in an approachable manner with just the right amount of mathematical foundation and with numerous illustrative examples. I learned of the book from Jörg Dummann, the force behind the atmospheric gravity wave forum at www.schwerewelle.de and a force behind the book. I think Dummann's forum is worth visiting, as well as studying the book. Unabashedly, I present my reviewer qualification with our flight and theoretical study of the most common atmospheric gravity wave used by glider pilots — the mountain wave [1].

Emeritus Prof. Dr. Etling is not a glider pilot but has participated regularly in Dummann's forums. He is a theoretical meteorologist with the Leibniz University of Hannover, Germany and a successful author [2, 3]. Dieter is an authority on wave physics and, by osmosis, knowledgeable about the characteristics of the mountain wave.

The book begins with an introduction to soaring and mountain waves in Chapter 1 and ends with a short history of soaring flight in Chapter 11. Etling initially planned to provide a popular treatment of gravity waves without mathematical formulas. But during the early stages, he writes, it turned out that some formal treatment of wave physics was necessary in order to understand the wave properties as experienced by glider pilots. These wave principles are provided in Chapters 2 through 6. Gravity waves suitable for soaring flight are presented in Chapters 7 through 10, which contain little formal treatment.

The mathematical formulas are presented step-by-step such that a reader with basic mathematical and physical knowledge can follow the explanations. For example, the math and physics he employs nicely describes the main features of the mountain wave: the vertical oscillations (the Brunt-Vaisala frequency) and the stationarity (schematic of a stationary gravity wave with a phase speed equal but opposite to the wind speed in Fig. 5.9).

As a meteorologist, I found the "rules of thumb" on Page 85 helpful. Thus, when I'm asked how to forecast mountain waves, I'll refer the person to this portion of his book.

The ability to search the downloadable PDF file for key words is an important feature.

The graphics are complementary to the text, clear and often in color. They are nicely nested near the text so the reader does not have to scramble about to connect text with a referenced figure or table.

The book's references, in print and online, contain the important gravity wave studies both past and present. Thus, the book is complete in its scholarship. It fits nicely between a thorough text book [4] and a primer written by a three-Diamond glider pilot and theoretical meteorologist [5].

In summary, the book should satisfy readers from those who want to thoroughly understand atmospheric gravity waves associated with soaring flight to the pilot who just wants to determine the next day they can fly in a mountain wave.

Bravo, Dieter!

References

[1] Hindman, E. E., McAnelly, R. A., Cotton, W. R., Pattist, T., and Worthington, R. M., "An unusually high summertime wave flight," *Technical Soaring*, Vol. 28, No. 4, 2004, pp. 7–23, Winner of 2004 Soaring Society of America Tuntland Award and the OSTIV Diploma for the best meteorological paper at the 27th Congress, 2006.

[2] Etling, D., *Theoretische Meteorologie: Eine Einführung*, Springer, 2008.

[3] Ortel, H., editor, *Prandtl — Essentials of Fluid Mechanics*, Springer, 3rd ed., 2010, D. Etling et al. (contributors).

[4] Nappo, C., editor, *Introduction to Atmospheric Gravity Waves*, Academic Press, 3rd ed., 2012.

[5] Hertenstein, R., *Riding on Air, Ridge, Wave and Convergence Lift*, Bob Wander, Minneapolis, 2011.