inherent in the digital implementation of continuous designs. Problems associated with actuator saturation and integrator windup are also discussed.

Appendix A, F-16 Model, completes the aircraft model introduced in Chapter 3. The model is described through table look-up aerodynamics for a range of Mach numbers up to 0.6 and for angle of attack and sideslip angles of $-10 \leq \alpha \leq 45$ deg and $-30 \leq \beta \leq 30$ deg in 5- or 10-deg increments. Engine data obtained from wind-tunnel tests as reported and summarized in a 1979 NASA Technical Paper are also included. The inclusion of this model in both the first and second editions adds significantly to the value of both texts. Appendix B, Software, provides the FORTRAN code that is required to trim and linearize the F-16 model. Although the text does not include a CD with the software that has been exercised throughout, the first author will provide the programs on a floppy disk at a nominal cost.

In comparing the second edition of *Aircraft Control and Simulation* with the first, one finds improved production values, significant additions to topics previously covered, and expanded problem sets, all accomplished with a only a modest increase in length. The text should be of value to any student, researcher, or practitioner interested in flight control and simulation.

Ronald A. Hess
University of California, Davis

Continuum Methods of Physical Modeling

K. Hutter and K. Jöhnk, Springer-Verlag, New York, 2004, 635 pp., $89.95

The subtitle of this book is "Continuum Mechanics, Dimensional Analysis, Turbulence." These are surely strange bedfellows. There is a connection, and it is through turbulence modeling and the formulation of general constitutive equations. The continuum mechanics section is thorough and complete, more or less following the Truesdellian School of Rational Mechanics, including the thermodynamics. This means that an inoculation against tensor spirochetes is desirable. The authors use words known only to people in the field, such as "equipresence" (which does not appear in the index), which are vaguely reminiscent of a Christian Science tract. There are exercises (and solutions), some of which involve physics.

It is a long time since I have seen dimensional analysis presented so formally. I suppose that over 50 years ago I saw Buckingham's Pi theorem, but people in fluid mechanics generally absorb their dimensional analysis with their mothers' milk. The presentation here is so formal that it is not clear to me that a reader would acquire the facility needed to deal with real problems in fluid mechanics.

The section on turbulence might be expected to be a little unusual. There is a very brief introduction to the physics, lasting about five pages. Averaging and the equations of motion are then discussed rather formally. This sets the stage for a discussion of turbulence modeling, from the same standpoint that the construction of constitutive equations was discussed in the section on continuum mechanics. Fortunately, the authors understand that there is no requirement that turbulence models be frame indifferent. With the stage set, the k–ε and algebraic Reynolds stress models are introduced and some real problems examined (the temperature distribution in a lake, for example).

Since Rivlin and Truesdell and the School of Rational Mechanics, continuum mechanics has suffered a bit from too much mathematics and not enough physics. In fact, the founders were not entirely guilty of that (however much else they might be guilty of); some very insightful physical statements can be found in Truesdell on occasion. However, the field does attract people who like that mix. I am afraid that this book is intended for such an audience. I would certainly not send a serious student of the physical sciences to this book to learn about turbulence. However, it might not be a bad place for a budding mathematician to learn a tiny bit about turbulence.

There is a lot of other good stuff here. Continuum mechanics is, after all, a fascinating subject. However, it is a good idea to remember that it was developed to explain phenomena and make calculations relating to die swell and other problems in chemical engineering. It is not healthy for a subject to become an end in itself, divorced from its roots. Continuum mechanics needs to be diluted with a bit of physics and lots of examples.

John L. Lumley
Cornell University