do not yet figure in the usual aeronautical literature.

The final chapter discusses the Boeing 747 and its competitors. The discerning reader, while being impressed by the arguments marshalled to show that the 747 design is a superior, practical compromise solution for intercontinental air traffic, may wonder if the Concorde has received its due. Issues of cost, sonic booms and commercial viability are real but should they completely obscure the signal advances in the science of flight embodied in the Concorde, the Ogee wing, for example? It is also surprising not to find even a passing reference to the indomitable DC-3 (the Dakota) – of which more than 10,000 were built and which ushered in the Age of Civil Air Transport. Some 500 of these are still flying around all over the world. These are small omissions.

Tennekes' book is informative, simply written and full of entertaining asides. People from many disciplines – especially young people – can learn and enjoy the science of flight. The book is well produced and beautifully illustrated. The $ 20 price may put it out of reach for some – but libraries must acquire a copy.

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Clifford (Geometric) Algebras. W. E. Baylis, ed., Birkhauser, Boston. 1996. 517 pp. DM 118.

This is a fairly large book (520 pages) on Clifford's geometric algebras written mostly from the point of view of applications in physics and to a much lesser extent, in engineering. For an introduction into the mathematical aspects of the subject, the reader may consult *Clifford Algebras and Dirac Operators in Harmonic Analysis* by J. E. Gilbert and M. A. M. Murray, Cambridge University Press, 1991.

Given a finite dimensional vector space V over real or complex field F, equipped with a quadratic form Q, one defines a Clifford algebra $\mathrm{Cl}(V,Q)$ over (V,Q) as the algebra generated by $\{\nu(v)|v \in V\}$ and $\{\lambda I | \lambda \in F\}$, satisfying $(\nu(v))^2 = -Q(v)I$. If we denote by $\mathbb{R}^{p,q}$ (p, q non-negative integers such that $p+q>0$) the real vector space $\mathbb{R}^{p+q}$ equipped with the quadratic form,

$$Q_{p,q}(u) = -\sum_{j=1}^{p} u_j^2 + \sum_{j=p+1}^{p+q} u_j^2 \quad (u \in \mathbb{R}^{p+q}),$$

then some simple examples of Clifford algebras emerge, e.g., $\mathrm{Cl}(\mathbb{R}^{0,0}) \simeq \mathbb{R}$, $\mathrm{Cl}(\mathbb{R}^{0,1}) \simeq \mathbb{C}$, $\mathrm{Cl}(\mathbb{R}^{0,2}) \simeq \mathbb{H}$, Hamilton's algebra of quaternions (which is isomorphic to the algebra generated by i times the Pauli matrices), etc. Then the basic results are that there exists a (universal) Clifford algebra over (V,Q) of full dimension $2^{\dim V}$ and this can be constructed canonically as a subalgebra of the algebra of maps on the exterior algebra on V, generated by the so-called creation and annihilation operators. Also the group $SO(V,Q)$ of orthogonal transformations on (V,Q) with determinant 1 has a covering group called spin (V,Q), whose Lie algebra is generated by the bi-vectors in $\mathrm{Cl}(V,Q)$. This feature enabled Dirac to construct the representations of the Lorentz Lie-algebra in his theory of electron.

Out of a total of 33 chapters in the book, 25 are devoted to various constructions involving Clifford algebras and their applications in physics. This reviewer found the chapter on the application of Clifford algebras in projective geometry and to computer vision the most interesting. Though it covers a wide range of materials, in some selected narrow areas, the book cannot be used either as a textbook or as a research monograph but only as a kind of a reference book.

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