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CALCULATIONS FOR FLYING MACHINES.

The Design of Aeroplanes. By Arthur W. Judge. Pp. viii+212. (London: Whittaker and Co., 1916.) Price 9s. net.

AEROPLANE stability is not the only subject in which progress has been retarded in the early stages of aviation. It is not so very long ago that Prof. Herbert Chatley read a paper on the calculation of the stresses in aeroplanes, and at the conclusion up jumped "Mr. I Don't Agree With You" and said he "didn't think" the results would be of any value. The consequence of this system is that a person who is really an inventive genius has to spend the whole of his time in fighting against the opposition and prejudice of people who "*don't think,*" and he can produce original work only when he can get a post-graduate student or assistant to do the whole working of the necessary details.

As a result of this retardation the literature dealing with the strength of the materials used in aeroplane construction and the stresses in their component parts is quite inadequate for the efficient development of aerial locomotion.

So far as this book deals with details of experimental statistics, it fills a distinct want, and it is sure to receive favourable reviews in our engineering journals. But a great deal of the subject-matter is nothing more or less than boiled-down mathematics, and the process of boiling down has in some instances been conducted in rather an amateurish way; moreover, the book contains statements that are certainly misleading, if not worse, for they cannot be correct if read as they stand.

In the first place a large amount of space is taken up in the appendices with tables for the conversion of units and things of that kind, but no tables are given for use in logarithmic calculations. Now it will be seen that almost all the formulæ quoted in the book, whether empirical or theoretical, involve products and powers rather than sums and differences, and for the efficient use of these formulæ a working knowledge of the use of logarithms is indispensable. The author may tell us that the class of mechanic for whom this book is written does not know how to use logarithms; if that be the case, the sooner he learns the better. He would then be spared an immense amount of time in turning over pages and pages of tables and possibly not finding what he wants at the end. The practice of mixing up tables of mere results of arithmetical operations with tables of experimental data cannot be too strongly deprecated.

The treatment of such matters as moments of inertia is on the whole fairly satisfactory, but it would be better if the author had stated the theorem of parallel axes *in words,* besides giving the formula on p. 113. Experience in teaching elementary students shows that it is very difficult to get them to interpret even the simplest formula in a verbal statement.

The graphic method for constructing a curve the area of which represents the first or second moment of a given plane curve about a given axis is very suitable for teaching purposes, though for actual working an alternative representation could be obtained more easily by the use of a cubical parabola.

In connection with the relative merits and demerits of monoplanes and biplanes, statements are made on p. 31 which are on the face of them at variance with elementary considerations of common sense. We are told that a monoplane possesses a lower head resistance, due to the absence of separate struts, ties, etc., and that it possesses relatively smaller moments of inertia about the axes of symmetry. But it is surely obvious that the use of superposed planes renders it possible to reduce both the framework and the span with the same lifting area. If Mr. Judge's statements are true of actual machines, it must be as the result of circumstances other than the difference between the one-decker and the two-decker type of wings, and this should be explained; otherwise the statements are calculated to mislead.

There must, however, be something much more seriously in error in the statement of the "Bird Flight Data" quoted from Dr. Magnan's conclusions on p. 33. In the seventh line we are told that the total length of a bird in centimetres is equal to the cube root of the total weight in grams; in other words, that the relation between length and weight is the same as in a cube of water. Further, the area of the body is equal to the square of its length. In the next formula but one we are told that the weight of the wings in grams is 197 times the total loaded machine weight in grams. After this follow statements that the chord of the wing at the centre is 2·36 times, the length of the tail 2·6 times, and the real length of the body 5·9 times the cube root of the weight, which has already been stated as equalling the total length of the bird!

While, therefore, the present book is to be welcomed as a step in the right direction, it will be seen that the subject still requires further revision. Had it not been for the discouragement which Prof. Chatley's early efforts received as the result of "discussions" consisting in expressions of premature opinions based upon insufficient data, we do not doubt that by now Mr. Judge would have been handling the subject on more strictly scientific lines. G. H. B.

PALÆOLITHIC MAN.

Men of the Old Stone Age: Their Environment, Life, and Art. By Prof. H. F. Osborn. Second edition. Pp. xxvi+545. (London: G. Bell and Sons, Ltd., 1916.) Price 21s. net.

PROGRESS in the study of prehistoric man has been so remarkable during the last few years that the demand for a rapid succession of more