

aeroplane will change all present ideas of warfare, that fundamental tactics will no longer be fundamental. It is to be regretted that those in aviation, in the army or in the navy, express such decided and often violent opinions of the value and power of the new arm, that they often destroy their own case and the confidence of those who are critical by over statements.

The greater part of "War on Great Cities" is given up to the actual facts of the results of air raids on London. Many photographs are given of the destruction caused and of many personal details of the raids. Two tables are given at the end of the book on the effects of incendiary bombs and explosive bombs dropped on London between May, 1915, and May, 1918.

A total of 354 incendiary bombs were dropped; of these 339 failed to cause any casualties, seven caused injuries only, and eight fatal injuries. Of the 567 explosive bombs dropped, 349 caused no casualties, 74 injuries only, and 144 fatal injuries. The figures are taken from the Fire Records of the London County Council and are for the Administrative County of London. The figures for the Metropolitan Police District, a considerably larger area, were greater. The total damage was estimated at £2,046,614. Altogether there were eighteen aeroplane raids and eight Zeppelin raids, 26 in all. Few places of importance were struck, and none which vitally affected the services, transport or administration of London.

Viewed in a cold historical light, with a knowledge of the progress which has been made since 1918 in speed, range and bomb-dropping power of modern aircraft, the prospects are appalling. But a hundred times the above figures would not put London out of action. The real thing which will matter will be the fall of one bomb on a particularly vital area of communication, and that will be an element of luck which no one can foresee.

It is difficult to predict the attitude of the population under intensive bombing, but it is not unlikely that the ordinary man in the street will adopt more or less quickly a fatalistic attitude which will certainly not lead to a wholesale flight from London. The attitude of the population in Spain is significant.

Intensive bombing of the civilian population, by its very horror, may well serve to stiffen the population to an extent which would make defeat far more difficult.

This is a book which is well worth reading and studying. The author's concluding words are worth quoting.

"Posterity will say to us that, despite the brilliant achievements of our age, we remained bunglers and barbarians at heart. We were the heirs of all the ages; yet we summoned from the ether a power which we had neither the wit nor the moral fibre to control."

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## CORRESPONDENCE.

*To the Editor of the JOURNAL OF THE ROYAL AERONAUTICAL SOCIETY.*

Dear Sir,—I should like to be permitted to comment upon Dr. Desch's most interesting paper on Magnesium Alloys, lately presented to the Royal Aeronautical Society. I am able to comment on this paper only in so far as it concerns the working properties of the wrought alloys, and anything that follows should not be taken as having application to castings in any form.

I should like first to pay tribute to Dr. Desch's review of the existing knowledge on the working properties of magnesium and its alloys, and particularly on the very clear statement of the technical results arising from the hexagonal crystal structure of magnesium. When Dr. Desch deals with the wrought alloys, with

respect I must protest that there is something to be said for a material having a low elastic modulus, provided, also, that it is light. Suppose, for a moment, that a stressed part, *e.g.*, in bending, is to be designed in Elektron and in Duralumin solely upon the value of Young's modulus in each case, and suppose further, that a satisfactory stressing in Duralumin for this hypothetical case is given by a circular section 6in. in diameter. On the basis of Young's modulus alone the corresponding diameter in Elektron would be 6.75in. This can be so, and still give a weight-saving to the advantage of the magnesium alloy of about 16 per cent., but, remembering the factor for the modulus of the section, this value in the case of the magnesium alloy is 60 per cent. greater than in the Duralumin section. This represents simply increased stiffness, and I suggest that 60 per cent. increased stiffness, gained with a weight-saving of 16 per cent., is a condition of the greatest possible value in aircraft construction.

As one who has had some experience with the alloys mentioned by Dr. Desch which contain aluminium, silver, cadmium, and so on, added for the purpose of improving the tensile properties, I must mention what I believe is a serious limitation to their practical application. Undoubtedly the improvement in mechanical properties as compared with pure magnesium by the addition of these elements is remarkable, but experience with alloys containing aluminium and silver, whether in conjunction with cadmium or not, is that the enhanced mechanical properties are obtained only at the expense of corrosion-resistance. Indeed, I have not yet known a silver-containing alloy which can be satisfactorily pre-heated in an ordinary muffle furnace without producing copious oxidation, usually sufficient to prevent any subsequent forging at all. It is only proper to say that, in respect of these alloys, the National Physical Laboratory recommendation is that they should be pre-heated for forging in salt baths, but when it is remembered that salt bath heating necessitates a quench or partial quench to remove the salt before any forging process can commence, it will be clear that there is here a serious limitation to the application of this type of alloy in practice.

With regard to the figures which Dr. Desch gives as being obtained from propeller blades forged in the press and without heat-treatment, the tensile properties are excellent, but the fatigue range seems rather surprisingly low. In an airscrew forging made from the Elektron alloy AZ855, which had in the butt a 0.1 per cent. proof stress value between 10 and 12 tons per square inch, a maximum stress of 19/20 tons per square inch, and an elongation of about 8 per cent., a fatigue range of plus/minus 9.0 tons per square inch was lately obtained in tests conducted by the Royal Aircraft Establishment. One wonders, therefore, whether, in the case which Dr. Desch quotes, alloying has gone somewhat past the point where the natural high damping capacity of magnesium is effectively employed. The point is of interest, because airscrew blades in Elektron have been flying for years, in which the proof and maximum stress figures were much lower, and the fatigue range was equal to or higher than those figures quoted by Dr. Desch. This rather defines the problem on magnesium alloys, which is not simply to increase the tensile properties, but to do so without proportionately decreasing the damping capacity (*i.e.*, the high hysteresis value) of magnesium and without impairing a corrosion-resistance not strikingly good to begin with.

Yours faithfully,

S. J. NIGHTINGALE.