In the discussion which followed Prof. Priestley stated that he had been a supporter of the cohesion theory of the ascent of sap, but that he was now so impressed with Copeland's criticism of the theory that he considered the latter incapable of meeting fully the criticism which it had raised. He desired to point out that Prof. Dixon had not replied to Copeland's challenge, demanding as it did an explanation as to how energy is employed in raising water in the stem. He further declared that no plant-structure had yet been shown to be capable of resisting the tensions which the cohesion theory supposed to be developed in the tree.

Prof. Overton expressed himself in general agreement with the cohesion theory, while Prof. V. H. Blackman considered that much work had yet to be done before a valid theory of the transport of organic substances could be constructed. There were difficulties in admitting that the wood furnished a downward path for organic substances, while at the same time it was engaged in transmitting the upward transpiration stream. In his opinion it seemed highly improbable that the bast is without a function. Whatever the function of the bast, he felt that it was associated with the downward transmission of food-stuffs.

In replying to the views which had been expressed, Prof. Dixon stated that in his opinion Dr. Curtis had not allowed sufficiently for the plugging arising in ringed stems. It was pointed out that the results of Dr. Curtis's experiments on branches with extirpated wood and on those the bast of which had been removed may, from the arrangements described, be explained on the known difference of resistance of wood to the transmission of water in a radial and in a longitudinal direction. In the opinion of Prof. Dixon the experiments described by Dr. Curtis did not necessarily indicate the transmission of food materials by the bast. Replying to Prof. Priestley it was pointed out that the energy for raising water in plants is applied by the transpiring cells in contact with the upper terminations of the conducting tracts. This energy is supplied by the inflow of heat at the evaporating cells or by the stored energy in the cells themselves. The tensions developed in the water are withstood by the strength of the thickened tracheal walls and by the osmotic pressures developed in the adjoining cells.

In conclusion, Prof. Dixon expressed himself in agreement with Prof. Blackman regarding the need for fuller inquiry on the subject under discussion before any theory of the ascent of sap and the transport of organic materials in plants could be generally accepted. He held that it is quite in accordance with the known structure and properties of the tracheal tissues, that upward and downward currents may be simultaneously passing in adjacent tracts. The small resistance offered by the wood to the longitudinal movement of water, compared with that which it opposes to transverse movement, secures the isolation of these two streams. Lest the unemployment of the bast should be used as a reproach against the cohesion theory of the transport of foodstuffs in the wood, he suggested that the companion-cells are glandular in function, and secrete enzymes which digest the colloids in the tracheæ. The sieve-tubes, he held, may be regarded as temporary reservoirs of these enzymes, while to the cells of the wood-parenchyma and medullary rays may be allocated the functions of introducing these enzymes into the tracheæ and of abstracting food materials from them.

J. McL. T.

Aeronautical Research.

THE issue of the report for the year 1923–1924 of the Government Aeronautical Research Committee is of more than ordinary interest, since it records that the desire expressed by the Committee, that greater recognition should be given to the claims of pure research, has been recognised, in one important respect, by the reorganisation of the old directorate of research at the Air Ministry into two new departments, namely, a Directorate of Technical Development and a Directorate of Scientific Research.

It is gratifying that the Committee is able to record steady progress in the different subjects embraced by the science of aeronautics. Research having a direct application to aeronautics is financed by the Air Ministry; the remainder, having a more general application, is financed by the Department of Scientific and Industrial Research.

Investigations on elasticity and fatigue of various metals have been arranged in the Universities of Oxford, Birmingham, and Liverpool; investigations on single-cylinder internal combustion engines have been started in the Universities of Cambridge, Durham, and Manchester, and in the City and Guilds (Engineering) College. In addition, there are the wholly subsidised researches carried out at the Royal Aircraft Establishment, the National Physical Laboratory, and the Air Ministry Laboratory in the Imperial College of Science and Technology, London.

The general field of work is so extensive that a local concentration on specific problems is necessary. In the year under review, one of the most important of the problems which has received attention is the control and stability of airplanes; the Committee justifies concentration on the attempt to secure low-speed control by the continued occurrence of accidents in which "spinning" is a primary or secondary feature. In this direction, slow but steady progress is recorded. It had been suspected for some time that one of the main reasons for loss of control in a stalled airplane lay in the fact that ordinary ailerons, besides applying a moment to roll the machine, also cause it to turn, which turn eventually introduces moments which defeat the primary action of the ailerons and render them ineffective.

A larger rudder is thought to be a part solution: a rudder of ordinary size may be capable of providing all the turning moment required in normal flight, but may prove inadequate in stalled flight, in that it must become less effective through being shielded by the body when the incidence is large, and because larger moments are required from it in order to balance those set up by the wings and by the ailerons.

The difficult problems of the cause of detonation in engines, and of the steps necessary to eliminate this feature in high-compression units, has been under consideration, and attention has been given to the bearing of American work in this field of investigation. Experimental work on engines has been undertaken in the Government establishments and in the Ricardo Research Laboratory.

The Committee records the Air Council's agreement with the view that a higher standard of technical knowledge in all ranks of the R.A.F., and particularly among squadron officers, is necessary, and states that steps have been taken to organise instructional courses at Cambridge and the Imperial College with this end in view.

The report is of modest dimensions; its form is that of a 50-page paper-covered pamphlet, and its issue price, 2*s.* 6*d.*, through H.M. Stationery Office, seems somewhat high.