the U.S. Army Air Transport Command, on the grounds that it is helping in our combined war effort. Exactly what the situation will be when the War ends, if the proposed freedom of the air is adopted, he did not mention. Pan-American Airways will have a complete monopoly of this, and possibly other Middle Eastern air routes, with machines, equipment, and personnel suited to the conditions as discovered by their experience. Apart from sentiment, Great Britain cannot show any claim to replace them. Without an alteration in our present policy, we shall certainly not be able to offer to the localities a better or even so good a service, lacking, as we shall, both experience and specially developed equipment.

The crux of the whole matter of policy appears to be that of the proportion of the aeronautical effort in Great Britain which is allowed to be devoted to civil aviation, particularly that part of it which is directed towards the long-range view of post-war requirements. The British allocation during 1942 was £5,000,000 given to one monopoly company, and a promise of a very small number of converted bombers and flying boats, none of which was conceived or designed as a commercial air transport machine, in the problematic future. Incidentally, £5,000,000, which Capt. Balfour described as "not such dusty crumbs", is the equivalent of about one day's expenditure upon war machines "at the rich man's table". Compared with this, the U.S. Aeronautical Chamber of Commerce stated recently that at present one fifth of the multi-engined production of aeroplanes in that country is devoted to cargo aircraft and that it is expected to rise to one third in 1943. In Great Britain we have British Overseas Airways as the only operating company. In the United States there are seventeen air lines operating under the direction of the Government authorities, but retaining their own individualities and spheres of influence. We have not one firm producing or even designing civil transport machines, whereas in the United States three of the largest concerns are producing cargo-carrying planes, while a fourth is just going into production on the world's largest passenger-carrying aeroplane, an 80,000 lb. monoplane, the "Constellation".

Any country's work in connexion with a total war must obviously be a balance between the production of direct war requirements and the many subsidiaries necessary to maintain national life. Aeronautics, as one branch of this, must be governed by similar laws. We may not be able to get more than a pint out of Capt. Balfour's pint pot, but the dregs allotted to civil aviation from the British pint would appear to compare very unfavourably with the gill that American aviation is getting from their pot. It is obvious that there are many facets to a political situation of this kind, and that it needs extremely delicate handling, but to the ordinary man it must appear that, in the world of aeronautics, Great Britain has either blundered or allowed itself to be jockeyed, which is really the same thing, into a position of bearing a little more than a fair share of the burden.

# HYDRO-ELECTRIC DEVELOPMENTS AND RECONSTRUCTION

THE report of the Cooper Committee on "Hydro-electric Development in Scotland" (see p. 187), the main recommendations of which have now been accepted by the Government and embodied in the Hydro-Electric Development (Scotland) Bill presented to Parliament, is a reconstruction paper which will require the early attention of whatever planning authority may be entrusted with the responsibilities recommended by the Barlow Commission or the Scott Committee. The report formulates a programme or policy without attempting to work out its practical implications to the last detail, but in doing so it promotes an admirable appreciation of the position of hydro-electric development in Scotland and supplement to the report on the Highlands and islands of Scotland issued by the Scottish Economic Committee in 1938.

The broad conclusion which emerges from the survey of existing electrical development is that the northern area of Scotland differs fundamentally from all the electricity areas of Great Britain and calls for an exceptional development policy, practice and outlook. In that area there is abundant water-power but no coal; there are no substantial industrial concentrations, and the population is very sparse and widely dispersed. Water-power as a source of energy has different economic and financial characteristics from those of coal-fired steam stations. That portion of the area popularly designated the Highlands has for long been a depressed area and will remain so unless vigorous and far-sighted remedial action is taken in hand without delay.

The Committee considers in some detail the two main theories of the future of the Northern Area, on which most of the proposals laid before it were based. One view, that any attempt to introduce modern industries and industrial methods is foredoomed to failure, since the Highlander cannot and should not be separated from his croft or his boat, however meagre the existence they are capable of yielding, is emphatically rejected. The other view, that the real test of the validity of any electrical project is the promise it holds of attracting new industries, proceeds upon the sound and only possible principle of treating the Northern Area as a whole, developing the more advanced districts as fully as possible, establishing new centres of development at selected sites throughout the area, and trusting to the gradual diffusion of prosperity from these focuses of development into the surrounding districts, including the crofting areas.

In regard to this view it should be remembered, as the Committee comments, that the provision of cheap and abundant electricity is only one, though a very important, factor in any programme directed towards the expansion of existing centres of industry and the creation of new ones. Secondly, the types of industry to which under the Committee's proposals the Northern Area could offer a very special inducement are those such as the electro-chemical and

electro-metallurgical industries, which employ very large quantities of electricity and for which the abundant supply of very cheap electricity is indispensable. In regard to these industries, the Committee states that it is inconceivable that a country such as Great Britain, which is so deeply interested in every aspect of the metal industries, could refrain from active and intensive participation in their remarkable development in recent years, especially in view of the increasing importance which in modern technique is attached to the use of alloys. Moreover, it is considered beyond controversy that there is only one possible zone for siting such industries in Great Britain, and that is in northern Scotland in the vicinity of the larger hydro-electric sources. In particular, the district adjoining the Cromarty and Beauly Firths, the Lochalsh area, the upper reaches of Loch Tyne and the upper reaches of Loch Linnhe are specified. If the post-war industrial economy of Great Britain is based on deliberate planning on the lines adumbrated in the Barlow Report, the Committee considers there is an unanswerable case for delimiting this area for the purpose of such industries.

The Committee is confident as to the possibility of offering these industries such advantages in power supply as will provide a powerful incentive to their establishment in the Highlands. It attaches importance to the uncovenanted benefits which may be expected to result from the introduction into this area of a new spirit of enterprise and initiative and the provision at strategic points of modern centres of the most modern industry, on the basis of which the local population can erect a better and richer economic structure the advantages of which should permeate every branch of the life of the people. It sees no reason why these new centres should not be planned as a model of what an urban centre in a rural district ought to be, and it anticipates nothing but benefits to the district as a whole from the establishment of such industries as new markets for the produce of the adjoining districts, from the incidental provision of improved transport facilities and from the numerous conveniences and amenities which must inevitably follow.

Whether or not this confidence proves to be justified will largely depend on the machinery by which the programme proposed is executed. Fundamentally, some of the most important opposition due to earlier proposals such as the Glen 'Affric project derived from the well-founded belief that no private corporation could safely be entrusted with powers which might affect so powerfully the amenities and the development of a whole kingdom. This important objection is eliminated by the Cooper Committee's first proposal, to create a new public service corporation, the North Scotland Hydro-Electric Board, to which would be entrusted the responsibility for initiating and undertaking the development of all further generation of electricity in the Northern Area for public supply, and its transmission and supply in bulk to the existing undertakings, as well as of the generation, transmission and distribution in all areas outside the limits of existing undertakers.

This Board should have three primary objectives in its development programme: to attract to the Highlands through the offer of cheap and abundant power a share in the vital and expanding electro-chemical and electro-metallurgical industries; to develop such further power as may be required for the consumers of existing undertakers or for consumers in its own distribution area, the surplus being exported to the grid; and to develop on an experimental and demonstrational basis isolated schemes in isolated districts.

The recommendations of this report are closely linked with the measures recommended by the Barlow Commission and the Scott and Uthwatt Committees. Not merely the reconstruction of a depressed area and the development of important new industries are involved. These problems are interlocked with those of the utilization of land as well as of natural resources—forestry, agriculture, the preservation of natural flora and fauna as well as of our scenic heritage, the provision of opportunities for amenities and recreation for the whole nation, questions of town planning as well as of country planning—all require consideration in the development and execution of a plan which will worthily meet the opportunities.

The Cooper Committee makes plain its opinion that it is opposed to any system under which a person whose property or interests may be affected by the execution of a large public utility scheme is entitled not only to claim compensation for loss he may suffer but also to oppose the entire scheme on its merits. Its proposals for compulsory powers and more business-like and modern machinery in this matter of acquisition and compensation, and for the exemption of new schemes from rates either permanently or for a prolonged development period, however, have not been incorporated in the Bill now before Parliament. The suggested provision for the appointment of an Amenity Committee selected by the Secretary of State to advise the new Board in framing and executing proposals is unlikely to be satisfactory, however favourable the precedents cited, unless the proposals of the Scott Report are also implemented. The issues raised by the Cooper Report are wide and general as well as specific, and afford an outstanding opportunity for bold enterprise on the part of the Government.

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# MECHANISM OF THE ELECTRIC SPARK

## The Mechanism of the Electric Spark

By Prof. Leonard B. Loeb and John M. Meek. Pp. xiii+188. (Stanford University, Calif.: Stanford University Press; London: Oxford University Press, 1941.) 3.50 dollars.

ALTHOUGH this interesting book bears the copyright date of 1941 at the Stanford Press, it has only recently been available in Great Britain, and will be regarded as an important supplement to Prof. Loeb's treatise "Fundamental Processes of Electrical Discharges in Gases" (1939). The reason for the appearance of a supplement to a very modern