

# NATURE

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## SCIENTIFIC UTILIZATION OF MAN-POWER

THE White Paper on machinery for the joint planning of the War which the Prime Minister has now wisely issued does not add greatly to our knowledge, although it puts into precise terms much information which has hitherto been given either informally or piecemeal. It fills a gap, and the discussion on the adequacy of our machinery can now proceed on a sounder basis. That discussion and criticism have been carried over from Parliament into the Press, notably in the *Economist* and in *The Times*. In the latter Sir Edward Grigg's able article, which has drawn comment from Lord Hankey, Lord Chatfield, Lord Swinton, Lord Strabolgi, Prof. A. V. Hill and others, advocates the introduction of a single chief of a Combined General Staff standing outside and above the three Chiefs of Staff and presenting one opinion to the Premier and the War Cabinet. The question of the best system is a practical one and not all the critics agree. Moreover, counsel is sometimes confused, and the *Economist* and Prof. A. V. Hill seem to have kept closest to the heart of the matter. The *Economist* insists that the General Staff that is required must be one trained in the technique of co-operation of all three Services but belonging to none, so that the difficulties sometimes advanced as to whether the navy is to direct military or air force operations or *vice versa* do not arise. The recent appointment of Vice-Admiral Lord Louis Mountbatten as chief of Combined Operations is an indication, however, that we are moving further than the White Paper indicates in the direction of the integration on which Prof. Hill lays his stress.

What is required, Prof. Hill holds, is an integrated war staff, a high command, designed for the purpose of planning the war as a whole, not further additions to existing machinery. Already, as the White Paper points out, to ensure that operational planning and production planning are even more closely combined, there has recently been created the Joint War Production Staff. Prof. Hill argues that a complete war staff must include several elements not present in a mere combination of Service staffs. First, a chief of technical staff, guiding research, design and development with a view to operational needs and keeping the war staff informed on technical matters; secondly, a director of operational research responsible for the scientific analysis of the results of past operations and the critical study of current operational plans and methods; third, a joint technical liaison and intelligence officer for civil defence, who could help to devise offensive and defensive policy in relation to the actual effects of bombing. The neglect of these technical elements has, in Prof. Hill's view, had much to do with our failures and disasters.

Mr. Lyttelton's announcement of the formation of a production panel promises to remedy what has long been lacking—the use of technical men of authority to report on the weak places in production, give advice on the spot, or present findings to the highest authority. Field-Marshal Lord Milne's

criticism of the joint war production staff is based on the staffing of its technical personnel from the Supply Departments instead of from the Service Ministries. He points out that chief technical officers of Supply Departments are not in the position to co-ordinate operational planning, because they are solely concerned with giving effect to a policy already laid down by the Service Ministry.

That criticism is valid up to a point, but unfortunately it is equally true that Service personnel have only too often proved incompetent to assess the significance for operational planning of technical developments. The basic charge against our operational planning is, in fact, that it has been too limited by Service traditions and experience, and too remote from the new possibilities of operations that technical advance has put at its disposal. The integration of the three Services in regard to a grand war strategy is not more important than the integration with them of the technical side to which Prof. Hill has directed attention.

The nearer we approach to our maximum effort, the severer are the limitations on our resources of materials or man-power, the more important are these questions of organization, co-ordination and integration at the centre. Improvisation can no longer be tolerated. Policy must be concerted and based on a view of the problem and situation as a whole, not of bits and pieces. Mr. Lyttelton has given clear evidence in his statement that he sees his problem as a whole, and the new White Paper provides at least some evidence that the Government is moving to the evolution of a common war strategy based on a corresponding vision and served by the appropriate instruments for its execution—though the pace may seem uncomfortably slow to some of the critics.

It is clear that the volume of criticism both within and without Parliament is having an effect in clearing away departmentalism and forging closer links and fuller integration between the three Services as a single fighting unit animated by the same spirit and the same conception of a common task. That integration, however, needs to be carried further and to embrace the production side of our war effort also. The beginnings of this were indicated in Mr. Lyttelton's first statement as minister, and its importance is further stressed in the latest of the long and valuable papers on war administration which have come from the Select Committee on National Expenditure. One of these, the seventh of the present session, while dealing mainly with matter falling within the sphere of the Ministry of Labour, raises the fundamental question of the distribution of man-power between industry and the Fighting Services.

This is the basic question of man-power policy. Without an answer to it we cannot judge how near Great Britain is to ensuring that every person in the community is contributing the best of which he or she is capable, nor can we make plans to that end. None of the several committees on man-power has as yet been charged with the task of finding out whether the proposed size and equipment of the armed forces represents the maximum military effort

which the country can make. Each was subject to the precedent condition that the numbers to be taken for the Forces had already been determined by higher authority. The really fundamental question, namely, the distribution between the Forces and industry which will enable the national man-power, having regard to the ever-changing needs of the war, to make the maximum contribution to the combined striking force of the United Nations, has never been put to them.

The Select Committee considers that it is essential that there should be an independent permanent body to provide at least the materials for an answer to this question—to consider and calculate the effects of any particular allocation of man-power between industry and the Services. Its principal task should be to estimate the best allocation of man-power between industry and the Fighting Services, and as part of that task it should also have the duty of examining the allocation of man-power between the broad categories of industry. The principal recommendation of the seventh report is the establishment of a permanent committee for this purpose, independent of departments and reporting direct to the War Cabinet.

A body of this character would go far to supply the breadth of conception and to stimulate the firmness of execution which are necessary for the development of the maximum military strength. Had it been in existence, for example, opposition to the fuel rationing scheme based on the pressure for release of miners for the forces could scarcely have been engendered. Moreover, there would be less danger that the need for expansion of output, here or in the munition industries, might be met by further recruitment of labour when more careful employment of the workers already engaged would have achieved the same end. The mere meeting of employers' demands for labour is not proof that the country's capacity is fully utilized, for those demands are not necessarily a measure of the real needs of the country.

What emerges from the rest of this long and searching report is the crucial importance of the human factor, as is also stressed in the report on the human side of war production, recently issued by Mass Observation (Charge No. 3. An Inquiry into British War Production. Part 1. People in Production). This report deals with the efficient use of the available men and women, and it fully corroborates the detailed analysis and recommendations of the Select Committee. Efficient production and the exertion of maximum effort are the outcome not only of wise direction and concerted policy at the centre but also of assiduous and unremitting attention to detail everywhere, above all in those matters which affect the welfare and morale of the industrial population. In this connexion the Select Committee holds that the general responsibility for welfare should rest with the Ministry of Labour, which is relatively independent of the factories and is already the principal department concerned with the well-being of employees. The reconstituted regional boards should undertake the responsibility for supervising the

efficient utilization of labour, labour supply in this way being treated as an integral part of the problem of production.

The forty recommendations of this report of the Select Committee are, in fact, largely directed against departmentalism and neglect to implement provisions already made. Emphasis is laid, for example, on stricter attention to securing that officials responsible for dealing with absenteeism, etc., exercise their powers fully under the Essential Work Order, as well as on the importance of disseminating technical knowledge, such as new methods of 'de-skilling' which bring about the more economical use of labour. Greater efforts to persuade managements to make arrangements for the part-time employment of women are recommended, and there is a pointed warning that it may be necessary to reconsider the exemption from compulsion of mobile women merely on the grounds that their husbands are with the Forces. How much this is a matter of organization and initiative is well brought out in a broadsheet of P E P (Political and Economic Planning) devoted to part-time employment.

Apart from welfare matters, there are pertinent comments on concentration. The policy of concentration, the report points out, will only have achieved its purpose if the total output from the industries concerned has been reduced to the minimum required to meet the needs of the Services, the civil population, and the export trade, with the minimum of labour and other resources, and if the labour and other resources released are actually transferred to essential work. Notably in the cotton trade these conditions do not appear to have been satisfied, and the Committee recommends emphatically that in determining the degree to which an industry should be concentrated the criterion should be the level of output required to meet war needs. The criterion for determining which establishments should be retained should be efficiency, and nucleus certificates should only be granted to the most efficient firms. Statistics of output and employment should be carefully examined and any unsatisfactory increase in the output per worker investigated. Closer check should be kept on the movements of workers released as a result of concentration schemes and, in particular, great care taken to make full use of persons in supervisory grades who are released as a result of concentration is recommended.

The importance of the distributive trades as a possible source of labour is once again emphasized by the Committee, and the observations on training include the recommendation that periodic investigations should be made to discover whether trainees are being properly placed and for the maintenance of contact between training centres and their more promising trainees to secure that, if they prove suitable, the opportunity for up-grading is not wasted. The cumulative effect of these detailed recommendations should be considerable, and if implemented they should go far to eliminate many sources of wasted man-power which, even if small in themselves, in the aggregate are increasingly serious in their effect upon production.

The eighth report of the Select Committee is concerned more specifically with the organization of production, and with the relation of production to strategy. It is indeed a lucid annotation of Mr. Lyttelton's statement on his functions as Minister of Production which was made between the drafting and the publication of the report. As in the report on labour, the Committee comments on the present improvisation and the absence of sufficiently prescient and progressive planning. The main need appears to be a better use of the available forces rather than an increase in their number. While recognizing the marked improvement of the last twelve months, the Committee is convinced that the Government, industrial management and the manual workers can and must do better.

It is for the Government to give the call and the opportunity to the other two main agencies to do their best, and for this reason the report gives most of its attention to Government direction and organization. On particular points which throw light on defects in organization, it notes the insufficient attention paid to the importance of greater specialization and to distributing contracts so that each manufacturer can concentrate on a limited number of types of product suitable to him, thus providing a sufficient run on each type to secure the most economical mass-production methods. Not enough attention has been paid to directing contracts, labour and materials to the most efficient factories where the man-hours on any job are lowest, or to the proper adjustment of work and capacity in the vast field of sub-contracts. Non-essential industries are still not properly regulated, and once again the importance of good personnel management and of proper arrangements for housing, transport and general welfare is reiterated.

On the general question of organization, the Committee reaches two main conclusions. First, there must be a supra-departmental authority to plan the programme, and secondly, the planning must be informed, based on an accurate appreciation of existing factors, and adequate forethought as to probable future developments. The evidence suggests that the programme for manufacture as transmitted to industry shows signs of inadequate foresight and sureness of decision. Accordingly it should have been possible for the Services to do better than they have in getting the right kind of weapons at the right time.

On the first point the Committee is satisfied that the new Minister of Production will be in a position to ensure unified direction. On the second, it stresses the vital importance of the Minister having at his disposal an adequately staffed intelligence and programmes organization, equipped with the means for collecting and interpreting all relevant data affecting the requirements of the Fighting Services, raw materials, supplies, manufacturing capacity and manpower. On this recommendation follows the further one that the Government should examine as a matter of extreme urgency what steps can be taken to improve the existing arrangements for ensuring that Fighting Services requirements are formulated with

precision and so far as possible in advance, and that these are worked out without delay in terms of 'production jobs' and introduced into the production programme with adequate notice to the manufacturers concerned.

Passing from the vital task of relating, or rather integrating, the planning of production with the planning of operations and strategy, the Committee insists upon the necessity for a clear appreciation of the proper functions of the various agencies concerned with the execution of the national programme. Strong arguments are advanced for further decentralization, particularly in arranging and supervising the details of production. Great reliance should be placed on the regional organization of the supply departments, and revision of the present constitution and powers of the regional boards is recommended. Simultaneously, the Committee directs attention to the importance of keeping regional officers fully informed by their departments on all matters which may have a bearing on their duties, as well as to the necessity of a clear chain of responsibility if there is to be effective co-ordination of departmental activities at regional level.

In all this the report is recalling established principles of scientific management which have been neglected, with the usual results. The Committee also advocates measures for devolving responsibility on industrial organizations and for fitting the smaller factories accurately into the national plan. Stress is once more laid on the importance of supervision of execution, and it is recommended that departments should take more active steps to ensure both that good methods developed in one factory are made known to others and that the most efficient works are brought up to the fullest possible employment in priority over those that are less efficient. Similarly, in keeping with Mr. Lyttelton's own statement, the report recommends that all possible steps should be taken to enable workers in factories to have a true understanding of the war position and of the conditions affecting the work in which they are engaged, as well as to encourage the formation of joint production consultative and advisory committees.

These two reports are heartening documents. Among the best of the long series that the Select Committee has given us, they put a searchlight on many weaknesses in the planning, organization and execution of our war effort, accompanied by recognition of the immense effort that has already been made. It is clear that a number of their recommendations have been anticipated, and it may well be possible that further adjustments as yet not made known have brought planning and administration at the centre even more into line with the scientific principles so clearly enunciated in these reports. The emphasis which is simultaneously placed on the need for decentralization, for concentrating in the regional organization sufficient authority to act with speed and authority comes, however, nearer to us all. It should bring into the production field the basic requirement of a subordinate officer in all the Fighting Services, namely, a thorough understanding of his superior's strategical plan as it affects his duties, and

a reliance on his own initiative in its tactical application. Given subordinates in production who can meet these requirements, we should go far to ensure that maximum co-operation and response from the human element upon which in the end both efficient production and final victory depend. Scientific workers cannot but welcome the evidence that further weight is being given to the technical factor in production and strategy, that the production general staff is itself becoming competent to contribute to the formation of strategy, and that a scientific mind and a scientific outlook are increasingly making themselves felt through the whole field of defence and offence, with the firm elimination of inefficiency or slackness wherever met, and steady, persistent improvement of methods as well as output and weapons. The new Appointments Department just established by the Minister of Labour to take over the Central Register and the Supplementary Register, implementing the reform promised last December, is only the latest evidence of this new determination to make full use of technical and professional qualifications and to distribute ability on a more scientific basis.

## THE ANALYTICAL FOUNDATIONS OF CELESTIAL MECHANICS

The Analytical Foundations of Celestial Mechanics  
By Aurel Wintner. (Princeton Mathematical Series, No. 5.) Pp. xii+448. (Princeton, N.J.: Princeton University Press; London: Oxford University Press, 1941.) 36s. net.

FROM the beginning of civilization one need not make itself felt, namely, for some form of calendar. In turn, this gives rise to the primitive study of astronomy, involving some knowledge of the sun and the moon. When the planets are added in the next stage, the astronomer needs an ephemeris or almanac; the modern Nautical Almanac, with its perfection within narrow limits, is the final outcome. There have been many stages on the road, and some apparent interruptions. But the urge has always been the same, essentially a practical one.

For the construction of the necessary tables or almanac some form of theory is required. Such a theory need not be true in order to have value, and in fact it may be grossly in error. Thus the first theory of any practical importance was the Ptolemaic, which assumed the earth to be fixed. On this were based the Alfonsine tables, completed in the middle of the thirteenth century. The results may seem crude, but with minor adjustments it is well to remember that, surviving the transition from manuscript to printing, these tables served all practical needs, however imperfectly, for three centuries; it remains to be seen whether any modern tables will last nearly as long. Then came the Copernican theory with a different frame of reference, but the results when expressed in the form of tables were no better, if indeed they were not worse. Next came the Rudolphine tables, based on Keplerian theory. Here a great advance ought to have been clearly visible, but it escaped the appreciation of all but one remarkable man, Jeremiah Horrocks. However, this theory