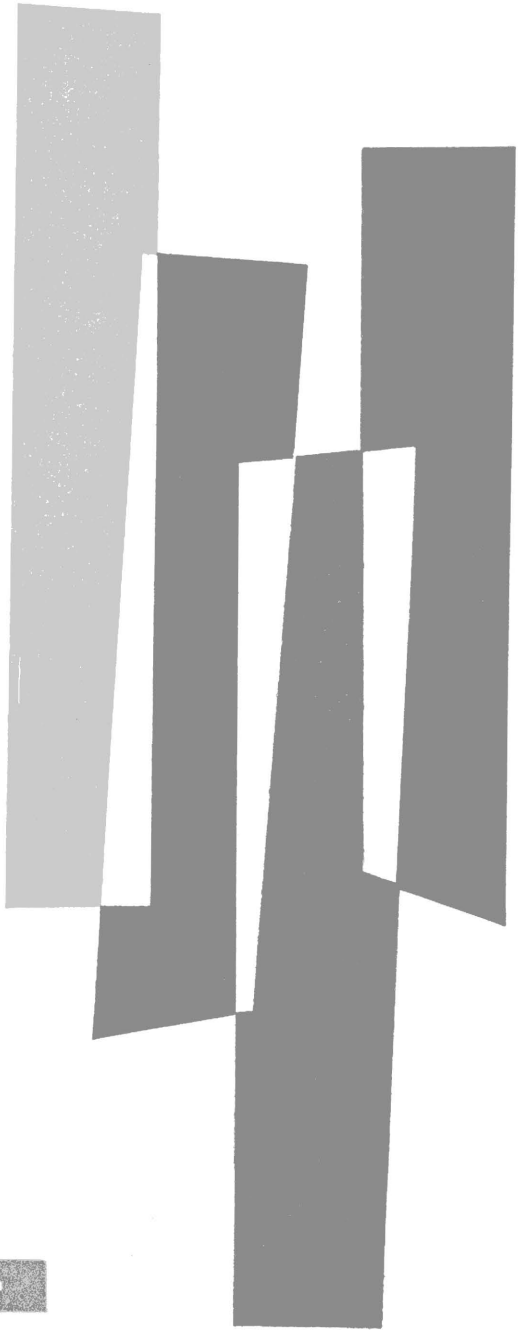
BULLETIN
OF THE
EUROPEAN COAL AND STEEL
COMMUNITY

THE HIGH AUTORITY



HIGH AUTHORITY POLICY CONCERNING RESEARCH ON INDUSTRIAL HEALTH, MEDICINE AND SAFETY

No. 60

LUXEMBOURG

11th year – No. 2

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PREFACE

BY J. FOHRMANN

Member of the High Authority

Ever since 1954, in accordance with its obligations under the Treaty establishing the European Coal and Steel Community, the High Authority has been working on a steadily expanding scale to develop and promote research aimed ad raising standards of personnel health and safety in the industries under its jurisdiction. In 1962 it reviewed its policy to date, in consultation with the expert committees which advise it in its research promotion work, and on the basis of this appraisal drew up a general outline indicating the policies and procedures which had gradually emerged over the eight years and the improvements and new departures that appeared desirable in the light of experience. The memorandum was then discussed in detail with the Consultative Committee, the Special Council of Ministers and the European Parliament, all of which went on record as fully supporting the High Authority's approach.

Since then, the High Authority has duly made the improvements envisaged. It considers that the pratical merits of its policy have now been sufficiently established and that the time has come to bring the matter publicly to the attention of all those concerned with research.

The High Authority takes this opportunity to pay tribute to the exalted sense of purpose shown by the members of the different institutions and bodies working with it, in accordance with the E.C.S.C. Treaty, in carrying out this policy in the field of human and social engineering. The Consultative Committee's function is simply to express "opinions" – but it expresses them *before* the Council of Ministers considers the High Authority's intended measures to decide whether it will give the necessary endorsement, so that in reaching its decision the Council is able to take into account the views of the employers, workers and consumers.

The co-operation machinery between the High Authority, the Council and the Governments has also worked very satisfactorily: thanks to preparatory contacts and consultations with the assistance of Government experts, the Council, being properly in the picture, has always approved the projects the High Authority has submitted to it with regard to health and safety. Again, research promotion owes much to the Committee of Presidents for its regular ratification of the High Authority's budget estimates, out of which the funds for the research grants have to come.

The High Authority's thanks also go to the many experts who, as members of a comprehensive advisory and operational network, are co-operating so actively and efficiently in the work of improving health and safety in the mining and iron and steel industries of the Community.

N.B. For the policy adopted concerning the promotion of technical research, the basis and aims of which are of course quite different, see Bulletin No. 41, *L'Action de la Haute Autorité dans le Domaine de la Recherche Technique (1965)*.

I.

INTRODUCTION

1. GENERAL REMARKS

One of E.C.S.C.'s main aims is what the Treaty generically terms "the improvement of living and working conditions" – that is, roughly, of conditions for the worker both on and off the job. This, it needs hardly be said, is very much bound up with matters of industrial health and safety as well as with technical and economic progress.

Betterment in the field of health and safety is very largely due to ever-expanding scientific research. Rising productivity, at once the cause and the effect of economic growth, is bound to have its repercussions on the human side. The factors which can affect the worker's health, able-bodiedness and state of physical fitness generally are complex and vary considerably in accordance with the many differrences in working conditions, and it is the function of research to investigate how best to bring the physiological and psychological needs of the worker into line with the requirements of the enterprise. Research is bringing about changes in operating methods and equipment: hence it must also seek to improve working and environmental conditions, and to forestall or overcome the problems posed by technological progress.

The authorities and the employers' and workers' organizations in the industrialized countries, and the specialized international agencies, are very much alive to the need for study and research on health and safety, and are encouraging them in a number of ways. The matter is one of particular concern to the mining and iron and steel industries owing to the specific occupational hazards there, and notably the exposure to accident and disease.

The organizations concerned with research promotion in this connection have commissioned studies by hospitals, health laboratories, physiological institutes and so on, and in view of the complex problems involved have in addition established specialized research centres staffed by highly-qualified scientists and provied with the necessary special equipment.

The establishment of E.C.S.C. in 1952 introduced two new factors into the situation: it enabled research resources and facilities to be pooled at Community level, and led to the starting, or stepping-up, of regular interchanges between the worlds of industry, science and the civil service.

Scientists have of course been concerned for many years to work up contacts likely to assist the progress of their particular researches. There are scientific associations, some confined to the areas in which a given language is spoken, some European and international; there are conferences at which researchers and specialists are able to meet. The existence of E.C.S.C., with its functions and powers under the Treaty, has helped to reduce the obstacles, linguistic or financial, to this intercourse and give it the necessary direction and continuity – an obligation clearly spelt out in the Treaty.

Only more recently, however, has the question of contact between industrial and scientific circles taken definite shape. While the need has always been obvious in the technological sphere, where the engineer and the chief executive are obliged in order to

carry on at all to innovate and modernize incessantly, as regards the human element it was long much less clearly recognized, such action as was taken springing more from humanitarianism than from clearly-sensed economic requirements. The growth of social aspirations, the rise in standards of living, the expansion of technical potentialities and the need for higher and higher productivity have brought home to society the increasing interdependence of man and machine and the consequent need for greater attention to the worker's welfare and environment. The Community, in virtue of its structure and *modus operandi*, has been able in this connection to make its own very definite contribution to the furtherance of contacts and co-operation among all concerned. What is more, on some matters it has succeeded in instituting effective and freely-accepted co-ordination in respect of various projects of value to the Community as a whole, with the active participation of the enterprises in which the research was conducted.

2. THE HIGH AUTHORITY'S LEGAL POSITION, AIMS AND POWERS WITH RESPECT TO THE PROMOTION OF INDUSTRIAL HEALTH AND SAFETY

Terms of reference and means of action

The High Authority's functions and facilities under the Treaty are clearly set forth in a report by the Health Protection Committee of the European Parliament, the following excerpt from which puts the relevant particulars in such concentrated from as to make further comments unnecessary[1]).

"(a) The safeguarding of industrial health and of industrial safety are essential elements in the 'living and working conditions of the labour force' which, by the terms of Article 3,e of the E.C.S.C. Treaty, it is the task of the Community Institutions to improve. Article 46,3,5 is more explicit on the subject: it requires the High Authority, in co-operation with the enterprises, workers, consumers and dealers, to 'collect information required to assess both the possibilities of improving the living and working condition of the labour force in the industries under its jurisdiction, and the factors constituting a thereto,' in order to equip itself 'to provide guidance for the action of all interested parties, taking account of the purposes assigned to the Community, and to dertermine its own action.'

(b) Article 47 empowers the High Authority to 'gather such information as may be necessary to the accomplishment of its mission and have the necessary verifications carried out,' and requires it to 'publish such data bs may be useful to Governments or to any other interested parties.'

Such being the terms of its legal mandate, the High Authority has been able

(1) to conduct consultations with employers' and workers' associations, Governments and researchers through committees meeting at regular intervals;

(2) to set up working parties at which practical problems in connection with health protection arrangements for colliery and steelworks personnel are discussed with industrial medical officers;

[1]) European Parliament Session Papers: April 22, 1965, Document No. 13 (rapporteur M. R. Pêtre).

(3) to compile and publish statistics on industrial accidents;

(4) to issue regular bibliographical documentation on specialized subjects for the use of industrial medical officers;

(5) to publish monographs and experts' reports;

(6) to hold information sessions on the latest developments concerning industrial health and safety;

(7) to organize systematic studies on the occupational retraining and social rehabilitation of physically-handicapped workers.

(c) Article 55 provides that

'the High Authority must encourage technical and economic research concerning ... industrial safety. To this end, it shall organize all appropriate contacts among existing research bodies. After consultation with the Consultative Committee, the High Authority may initiate and facilitate the development of such research work by encouraging joint financing by the enterprise concerned, by earmarking for that purpose any grants it may receive, or, with the agreement of the Council, by earmarking for that purpose funds derived from the levies on coal and steel production (Article 49). The results of the research so financed shall be placed at the disposal of all interested parties in the Community.'

(d) The High Authority has duly availed itself of the possibilities afforded it by the Treaty, concentrating particularly on the promotion of research on industrial health and medicine, traumatology, prophylaxis, therapy and occupational retraining, and on human factors affecting safety. Thus it has

(1) caused research centres in the member States to work on problems connected with industrial health and safety in the E.C.S.C. sectors;

(2) instituted a genuine partnership of science among research centres;

(3) assembled and made available to potential users a very substantial fund of fresh knowledge;

(4) issued reprints of scientific papers published in specialized periodicals;

(5) prepared and published reports on the results of research programmes sponsored by it;

(6) organized study and information sessions."

Objectives

The High Authority's attitude to the aims just described has all along been fully in line with the maxim written into the Constitution of the World Health Organization in 1948, that health is "not merely the absence of disease or infirmity," but "a state of complete physical, mental and social well-being." Its object has therefore been not only to ensure that workers are safeguarded, by the maintenance of conditions compatible with the minimum tolerances of the human body, against factors liable to impair their fitness and working capacity, but, above all, to see that constant efforts are made to establish

environmental and working conditions which in addition to eliminating actual hazards will bring a steady increase in general well-being.

This is of course a long and exacting business, and the first stage has had to be devoted to tackling promptly a number of specific undesirable influences which are particularly in the public eye. Much valuable work has been done, and the High Authority is now able, while continuing to press ahead in this direction, at the same time to give more of its attention to promoting research on the adjustment of job to man and man to job, with special reference to current advances in technology.

In doing so it is acting in consultation, and in some cases in co-operation, not only with the other Communities, but also with the international organizations having to do with this field, including in particular the International Labour Office, the Council of Europe, the World Health Organization and the Organization for Economic Co-operation and Development.

3. *GENERAL OUTLINE OF THE ARRANGEMENTS FOR PROMOTING RESEARCH IN HUMAN AND SOCIAL ENGINEERING*[1])

The High Authority first embarked on the promotion of research on industrial health and safety in 1954.

The initial step was to set up a committee of scientific experts, then shortly afterwards a committee of experts from industry, and finally a committee of Goverment experts, the three forming the nucleus around which a system of co-ordinated activities was thereafter progressively built up. Following a small-scale experimental programme launched in 1954, practical procedural arrangements were quickly worked out, while the general outline of research policy developed empirically with assistance and advice from the various quarters concerned, and more especially from the Consultative Committee, the Special Council of Ministers and the European Parliament. In 1962 the High Authority, after reviewing the matter with its advisory committees, made a number of changes, ultimately settling on the general approach here described, which prior discussions with the Consultative Committee, the Council and the Parliament had shown to be precisely in accordance with their ideas on the subject.

Before we go on to outline this policy and briefly indicate the main projects completed and in hand, it may be worth-while to attempt a quick sketch of the nature of the High Authority's work. Two points in particular seem to merit attention.

(a) The first is that a number of high-level consultative and operational bodies attuned to the needs of the mining and iron and steel industries have been progressively instituted, in liaison with the authorities of the different countries, for the purpose of deferring, the research projects to be undertaken, assessing their value, following them through their various stages, drawing up covering reports, and ultimately disseminating the findings. Thanks to the co-operation the High Authority receives from experts concerned, working either in its committees or in their own national Ministries and other institutions, E.C.S.C. assistance is effective, practical and to the point.

[1]) An organization chart will be found in Annex I.

These arrangements, the decision to establish which was taken in 1954 in accordance both with the spirit of the Treaty and with the advice of the other Community Institutions, represented at the time something of a new departure; similar systems are now coming into being in quite a number of countries desirous of bringing their research policies as closely as possible into line with the requirements of technological and economic progress.

(b) The second point is the remarkable combination of continuity and flexibility which is made possible by the sponsoring of research under specified programmes. The programme system is of course useful as regards financial and administrative convenience, but that is not why it was adopted. It was worked out with the Consultative Committee and the Council in 1955. On the human and social side the High Authority was not anxious to employ the procedure sometimes preferred of granting a lump annual appropriation to universities or research centres with no indication of the particular field, let alone the projects, on which it is to be expended: such a policy, quite apart from the failure to designate the areas of research, and more especially those relating to the Community industries, was entirely unsuited to an organization like the High Authority, which is at pains to avoid usurping the functions of the national bodies responsible and aims principally at encouraging new avenues of research and assisting long-term projects. Nor, on the other hand, did the High Authority wish to follow the example of some foundations which simply support piecemeal projects in given fields as when these are put forward.

One of the advantages of the programmes, which usually last between three and five years, is that they ensure sufficient continuity in research in a particular direction without the accompanying millstone of grants fixed in advance and renewed annually; another is their outstanding flexibility, thanks to which a start can be made immediately it appears from consultation that concentration on a given aspect is called for. Again, over and above their operational convenience, the programmes have a definite guidance value for researchers, in that the lines of research desired by the two sides of industry can be clearly defined and encouraged both by the endorsement of individual projects and by the planning of co-ordinated Community-level studies.

Progress in the sphere of human and social engineering is achieved by the co-ordination and channelling of a multitude of small-scale efforts, and both the Consultative Committee and the Council have come to the conclusion that their influence would be more effective if concentrated on umbrella programmes rather than on the jumble of limited individual projects that are submitted when programmes are published with invitations for tenders.

System of consultation

The High Authority's consultations on research promotion are of two kinds, those specifically provided for by the Treaty, with the Consultative Committee (representing the coal and steel producers, workers and consumers) and the Council of Ministers (representing the Governments), and others with its own committees of researchers, civil servants and experts from within the industries, which give it the benefit of their specialized knowledge.

The second form of consultation operates as follows:

(1) through the Joint Committee on Industrial Safety and Medicine, consisting of experts from the employers' federations and the trade unions. Their job is, from their experience of the enterprises' day-to-day requirements, to suggest appropriate areas of research and indicate the particular problems involved. In 1960 the Joint Committee asked the High Authority to arrange for the matters referred to it to be studied in advance by a small sub-committee: this considerably eases the work of the full Committee, and enables it to offer the High Authority much more detailed and thought-out comments.

Spending their time as they do amid the facts on industrial life, the Joint Committee's members are able to do much to get research slanted in accordance with their anxiety to see that every possible care is taken of workers' health and safety. They are of great assistance to the High Authority in devising ways and means of aiding the carry-over from the "production" stage of research to the "consumption" stage of practical application;

(2) through the various specialized Research Committees, consisting of researchers. Their job is to indicate what, from their scientific and technological experience, they consider the best ways to go about achieving the objectives proposed, and also to appraise the scientific value of the research projects submitted to the High Authority, to help foster co-operation among researchers, and to assist the High Authority in evaluating and disseminating research results;

(3) through the similarly specialized committees of Government experts, whose experience of national research promotion and possession of data supplied by their respective industrial inspectorates and other national bodies dealing with matters of health and safety enable them to express an informed view as to how the High Authority can most effectively supplement the research already going on at national level and explain just what is being done by each research center in this connection. In addition, they are expected to follow the progress of E.C.S.C.-sponsored studies and examine how far the findings could be embodied in official regulations or Acts of Parliament.

The three sets of committees play their part, each from its own special angle, in the preparation and implementation of the programmes and the evaluation and utilization of the results. In its determination to make its policy work really effectively, the High Authority makes a point of obtaining the opinions of them all, despite the administrative complications for itself and the consequent tendency for delays to occur in getting projects started.

The consultation system, then, is based on continuous interchanges between the High Authority and the researchers', Governments' and industries representatives, and discussions with the Consultative Committee and the Council of Ministers. In addition, an important part is played by the European Parliament, and more particularly its Health Protection Committee, in orienting and superintending the High Authority's work.

Research programmes and schemes and their implementation

The programmes set forth the various problems on which the High Authority wishes

attention to be concentrated within a given area of research. The successive stages in their preparation and implementation are as follows.

Preparatory stage

The High Authority makes use of its consultation system to pinpoint the basic problems involved. The make-up of the programmes so framed differs according as the subject comes within the field of industrial health or of occupational medicine and safety.

The programmes indicate the following particulars:

(1) problems and aspects to be dealt with;

(2) nature, duration, approximate number, and scale of projects;

(3) launching procedure;

(4) total appropriation.

After hearing the views of the Consultative Committee and the Council, the High Authority takes its final decision, and proceeds to the next stage.

Launching stage

(a) By public tender

The High Authority brings the programme to the notice of the research centres by advertising in the *Official Gazette of the European Communities* and in specialized periodicals.

This method has the advantage of drawing researchers' attention to E.C.S.C.'s more pressing problems and so creating interest in them: it is not unusual for researchers on discovering the existence of the programmes to start work on the lines indicated without applying for a High Authority grant at all.

At the same time, it does land the High Authority with a very large number of applications, all of which have to be carefully gone into at the cost of much time-consuming technical and administrative work.

(b) By direct arrangement

In the course of its research promotion work the High Authority has observed that a number of knotty problems are already being investigated by research centres specifically set up to deal, or traditionally dealing, with long-term problems of concern to the Community industries. Some of these have received High Authority grants for training the researchers and obtaining the equipment needed to enable them to concentrate on lines of research relevant to the purposes of the Community.

Such centres, selected in consultation with the experts, are approached direct with a request to work out individual projects for inclusion in a particular Community research scheme.

(c) By special co-operation

There is in addition a special procedure whereby the High Authority itself works out in detail what are called "joint common projects," and has them carried out by different centres working in close co-ordination under arrangements made by *ad hoc* secretariats operating in liaison with the High Authority.

Adoption of projects stage

The projects are scrutinized by the appropriate High Authority departments, with the assistance of scientific, industrial and Government experts, as to

(1) subject to be studied, its conformity with the overall programme and integration into the co-ordinated scheme;

(2) qualifications of the researchers;

(3) resources of the research centre;

(4) amount of financial assistance requested.

When the High Authority has finally picked the projects deemed most worth pursuing, contracts are signed with the bodies and indiduals concerned (research centres, project planners, trusteeship institutions) on the basis of the particulars supplied by them.

All projects relating to a particular aspect within the programme as a whole make up a "research scheme." The next stage then supervenes.

Operational stage

The High Authority does not simply pay out funds: it also helps by organizing co-operation within each particular sector of research and provides various kinds of supplemantary assistance.

(a) Co-operation

The co-operation arrangements are instituted as soon as the projects are approved. From then on the High Authority staff members responsible, assisted by the experts, keep in touch with developments—the progress of the work, changes in the research teams, any organizational alterations at the centres, interim publications—by regularly studying the researchers' twice-yearly reports and visiting the centres.

The culminating stage for each project consists in assembling data and making a statistical and critical evaluation from which the researcher can work out certain conclusions. When this has been done the High Authority makes a point of arranging for the researchers to compare notes on their respective findings; these discussions enable them to suggest improvements and additions to one another's methodology and the interpretation of their findings, enhancing the value of the end results.

A fuller account of this procedure will be found in Section III.

(b) Supplementary assistance

The High Authority considers that the provision of grants and encouragement of co-operation among researchers constitute a great part of its job as regards research promotion. However, it also assists in other ways,

(1) by helping to keep researchers supplied with relevant documentation and abstracts of published matter on scientific subjects from different parts of the world, so as to make the most of research results already obtained. This is done partly by the High Authority itself and partly in co-operation with the International Industrial Safety and Health Information Centre in Geneva and other specialized agencies;

(2) by enabling individual researchers to go on study tours and extended visits to other research centres in order to improve their knowledge and qualifications. The object is to give them the opportunity to obtain technological or methodological particulars of relevance to the research programmes from their opposite numbers elsewhere in the Community or in other countries.

Further details in this connection are given in Sections III and IV following, on co-operation and dissemination of information repectively.

The High Authority has also frequently been asked to give more direct assistance towards the training or specialization of young researchers in some branches of human engineering still in process of development.

Dissemination and follow-up stage

The submission of the final reports marks the end of the actual research under the programme concerned, but not the end of the High Authority's promotion work: as it wants the results put to practical use, the High Authority feels obliged to take the necessary action to encourage this (see Section IV).

One or two further points should be made in this connection. The programmes are scheduled as a rule to take four or five years, in order to ensure continuity of research over a long enough period for real advances to be made. This does not mean, however, that each piece of research carried out within a programme takes the same length of time: each programme comprises both pure research lasting the whole of the period concerned and applied research of varying duration, some projects specifically on one particular detail of technology being completed in a much shorter time. Naturally the duration of a whole programme cannot be based on that of a single category of research, since the advancement of knowledge requires that short-term and long-term studies should be carried out simultaneously.

Guiding criteria

In weighing up research programmes and projects the High Authority bases itself on the following criteria.

Content and aim of research

(a) Subject

Has the subject been defined with sufficient precision?

Is it in line with the objectives envisaged, and does it fit into the programme?

Where the objective is twofold – improved efficiency and performance for economic purposes, and improved protection of health and/or safety as such – it is necessary to settle which of the two is primarily aimed at.

(b) Approach

Is the approach the right one?

In the High Authority's view, encouragement must be given equally to pure and to applied research. It is aware that pure research is a longer-term affair, and it considers itself called upon as a European Institution to assist such pure research as is likely to make a difference all round, or costs a great deal to carry out. However, it is careful to make sure that sufficient account is always taken of specific Community concerns and that the practical-application angle is properly borne in mind.

It is worth noting, incidentally, that distinctions as to the aims and value of "pure," "applied" and "development" research are tending to become blurred. It has been found that where practical application involves devising extremely intricate technological solutions it is often quicker to restudy some aspects of the problem from the ground up, so that by the time the application stage is reached again the technical difficulties are no longer the same, being either actually easier to handle or at any rate more fully understood.

(c) Number of projects

The number of projects envisaged must be in line with the organization and technical facilities of the research centre.

(d) Originality

The High Authority has no wish to duplicate work already in progress: continuations of research aided by it in the past must represent genuine moves into a further stage, although now and then there is what might be called "deliberate duplication," where parallel projects are begun in order to compare the eventual findings.

Originator of project

A specially relevant criterion in assessing a project's chances of success is the professional standing of its originator. Points

(a) degrees, diplomas, honorary academic distinctions;

(b) specialization in research area concerned;

(c) any specific publication (a valuable guide).

Scope of research centre

It is necessary to know

(a) the specific function of the centre, *i.e.* research alone, research and teaching, research and routine analyses, etc. Some departments at individual enterprises, though ordina-

rily doing only routine work, may well be ideally fitted for carrying out certain investigations, and so rate as "occasional" research centres or as ready-made collaborators for the responsible centre proper;

(b) specialization of the centre: some centres concentrate exclusively on a single restricted field of research, while others have a more comprehensive range in that they comprise several departments working under specialized directors;

(c) facilities at the centre: the position in this respect has also to be ascertained, since each type of research requires certain basic equipment;

(d) location of the centre: also relevant, especially with regard to applied research in connection with certain groups of industries.

II.

ENCOURAGEMENT AND FINANCING OF RESEARCH

Given the existing research network in the Community countries, the High Authority considers the need is primarily to encourage the extension of actual research rather than the opening of new centres. As regards industrial medicine and health in particular, the E.C.S.C. countries and industries have long had their own specialized centres, and it is mainly in the newer fields of industrial psychology and job adaptation that action is required to set up special research establishments. The facilities offered by the High Authority have at any rate resulted in the formation within each Community industry concerned of research teams to deal specifically with these two latter aspects and their applications.

E.C.S.C. Financial assistance

E.C.S.C. assistance is given to enable particular projects to be carried out: it is not simply subsidization without strings.

Research costs assumed by E.C.S.C.

To be precise, High Authority grants cover expenditure incurred directly in connection with the research it is prepared to sponsor, that is, on staff, purchase of the necessary equipment and so on.

(a) The personnel paid out of grants are mainly extra staff (junior researchers and laboratory assistants) engaged to work under the research director. Research on industrial health, medicine and safety is usually conducted by teams each member of which has his own special line: grave difficulties arise should any member leave, particularly as the shortage of researchers makes it always extremely difficult to find replacements. Consequently, for the sake both of the research and of the researchers it is necessary to offer some assurance of steady employment. The contracts signed with the research centres therefore provide that one main object of the grants must be to enable members of the team to be paid extra allowances in respect of the research they are to carry out. If the contract specifies two, three or four years'research, the researcher can count on fair stability of employment for that period, though stability is in only definitely assured within the limits of each research programme.

    At one stage the idea of building up a permanent corps of researchers was discussed at a number of meetings. The nationally-constituted teams collaborating on some Community-level projects do in pratice, indirectly, form part of such a corps.

(b) The equipment costs and overheads paid from grants consist chiefly of expenditure on special apparatus, chemicals and so on required for the research. In the case of applied research the grantee often makes the necessary installations available.

(c) With co-ordinated Community-level research it is necessary to finance not only the actual investigations but also the co-ordination and co-operation arrangements, which

are particularly important since it depends partly on their effectiveness whether the different research teams involved are able to work smoothly or not.

Auxiliary character of E.C.S.C. grants

Since the High Authority intends its assistance only as a contribution, it usually keeps it within certain limits, varying the amounts in accordance with the value of the research to the Community.

Amount of E.C.S.C. grants

The amounts granted depend on the nature and scale of the research.

(a) The costs of medical and psychological research vary, as they depend largely on the number of observations to be made: the higher the number (groups of persons, batches of experimental animals) the higher the overheads and personnel expenses.

(b) Inter-disciplinary research involves substantially higher expenditure on personnel.

(c) In research on industrial health equipment is a major item, particularly in the case of experiments on a semi-industrial scale or at pilot installations, (as for instance the work on control of brown smoke in and around steel plants, and on dust prevention and suppression). The contracts contain clauses specifying that E.C.S.C. funds are to be used for research, and not for capital investment.

Employment of E.C.S.C. grants

Each project is covered by a contract between the High Authority and the research centre or project planner setting forth the terms and conditions of E.C.S.C. assistance. These are agreed among the various High Authority departments involved, including more particularly the Legal and Finance Divisions: they relate, *inter alia,* to responsibility for research and financing, various guarantees as to the use to be made of the appropriations, arrangements for making the findings available, and so on.

Fixing of research appropriations

In accordance with these terms and conditions, the High Authority fixes the sum to be set aside for the research, concerning which the Consultative Committee and the Council of Ministers then state their views.

Conclusions

Whatever the financing procedure adopted, the High Authority has made a point of furnishing substantial assistance for research on industrial safety and medicine. Although nationally quite sizeable sums are being allocated for this purpose, they represent in most countries only a fraction of the amounts being spent on technical research. The High Authority on the other hand feels it right to concentrate more or less equally on the technical and on the human and social side, thus helping to further and co-ordinate research in the fields of importance to the Community without encroaching on the domain of the authorities and bodies responsible for research promotion at national level.

This outline of the High Authority's principles and aims in encouraging and financing research obviously cannot include a full description of the activities sponsored: a separate account of these is given in Section V following, while the subjects dealt with are listed in Annex 3.

III.

FOSTERING OF CO-OPERATION

For research promotion to be successful, the researchers' activities must be properly interlinked. The High Authority's aim in encouraging co-operation among researchers is twofold, to enhance the effectiveness and prospects of the projects it is aiding, and to help the researchers themselves to keep in touch with developments and so make their work easier.

The High Authority is particularly well placed to undertake the systematic organization of such contact, since as it is itself engaged in sponsoring research it knows the problems under investigation and the specialists who are investigating them. Consequently, it is able to group those working at the various European research centres into categories according to their particular line of specialization, and provide opportunities for them to meet and learn about one another's work in relation to the objectives of the E.C.S.C. programmes. These frequent meetings serve to create an atmosphere of confidence and fellow-feeling which is beneficial to their professional collaboration.

Co-operation within programmes

There are three main forms of co-operation among researchers working under a particular E.C.S.C.-aided programme.

(a) Individual projects

The High Authority's various working parties on specific problems do more than simply discuss: they enable the researchers taking part to establish a rational division of labour and to help and advise one another throughout the progress of the research. A number of experts are specially commissioned to aid the High Authority in assisting co-operation. The working parties meet periodically to hear progress reports; the detailed records of their meetings are a mine of information and much consulted by researchers in their work. The members include not only researchers in receipt of grants, but also other specialists from both inside and outside the Community.

Some of the working parties are made up of experts from more than one field of science, corresponding to the mixed character of the research being conducted in certain connections, as for instance that on industrial health, which requires the co-operation of physicists, chemists, biologists and doctors, or on industrial safety and ergonomics, in which it is necessary to have physiologists, psychologists, engineers and various other specialists working in together.

(b) Research by direct arrangement

Co-operation is an essential feature of the whole system by which the High Authority approaches selected research centres and requests them to divide up the work entailed in the investigation of a particular subject. It is established at the outset and takes

practical shape in the planning and financing of the projects and the sharing of the work and findings.

(c) Common research

In the case of so-called "common research," several research centres are asked by the High Authority to carry out jointly a project which has been drawn up in advance.

Here co-operation is particularly close, the researchers concerned settling among them the subjects, methods and working schedule. Under this arrangement the work is allocated among researchers in different countries, who form in effect a European team, with the result that sense of partnership among them is especially strong. In some cases the organizational side is in the hands of specially-established secretariats working in liaison with the High Authority, which are responsible for co-ordinating the studies and dealing with matters of relevance to the purposes of all the teams.

Broader-based co-operation

The High Authority does not confine itself to encouraging co-operation among researchers working on projects specifically aided by it, but also arranges for other experts, notably from the intergovernmental organizations and from non-Community countries, to play an active part. Here the aim is, firstly, to promote comprehensive exchanges of information, enabling the researchers to acquaint themselves with various allied matters under investigation outside their own particular speciality, and secondly, to have individual points studied in detail by *ad hoc* working parties.

Also, although E.C.S.C. has of course to do mostly with problems peculiar to its own industries, the High Authority realizes that it is greatly to its advantage to associate the other European Institutions and international bodies with the preparation of its programmes. Appropriate channels of consultation have accordingly been established.

Study tours and visits

Researchers, especially juniors, can apply for travel grants or special allowances to enable them to pay extended visits to research centres in other parts of the Community or elsewhere.

This type of assistance and co-operation—which is not confined to researchers engaged on High Authority-sponsored work—enables information to be assembled on current progress in the fields of interest to the Community, often makes the research centres' job easier, and, of course, helps the researchers themselves to acquire additional knowledge and qualifications.

Information obtained in the course of tours and visits is embodied in reports which are issued to researchers.

IV.

DOCUMENTATION, INFORMATION, DISSEMINATION OF RESULTS, ENCOURAGEMENT OF PRACTICAL APPLICATIONS

The High Authority undertakes the dissemination of research findings in order to aid other researchers in their own work and to help those responsible for personnel health and safety to get them applied in practice. Researchers are, of course, entirely at liberty to publish details of their own activities and results independently.

The High Authority's work in this connection is organized as follows:

(a) first, the results as recorded by the researcher himself (reports, publications, papers, etc.) have to be made generally available;

(b) to put them into a form more readily assimilable by prospective users, the High Authority prepares covering reports summarizing the main conclusions from the work in a given field;

(c) in order to promote the practical adoption of these, it then convenes meetings of the people directly concerned in the industries (safety engineers, medical officers and so on) to discuss the possibilities for introducing the new advances, whether generally or on a restricted scale, or perhaps only experimentally.

1. PROCEDURES FOR PROVIDING INFORMATION BOTH AT SCIENTIFIC AND AT PRACTICAL LEVEL

Abstracting

This is not confined to work within the Community countries, but covers world literature is a whole, since it would be pointless to embark on research which has already been done elsewhere. Every research centre has long had its own library and systematically scanned the specialized periodicals it subscribes to, but there are so many periodicals and publications in different languages that it is impossible in pratice for any one centre to deal with them all. The High Authority, feeling that their individual activities in this regard should be co-ordinated, has instituted the following arrangements to facilitate the coverage of original contributions appearing in the world generally.

(a) In 1954 it set up a Medical Documentation Pool, which initially dealt exclusively with *pneumoconiosis.*

A selection of European research centres specializing in this field divide up among them the relevant literature to be scanned, from which they prepare abstracts of the more important contributions. These were to begin with issued in only a few copies, primarily to give researchers the gist of the latest advances in scientific knowledge, but as time went on interest in them increased considerably, industrial medical officers finding them very useful as a means of keeping abreast of progress on pneumoconiosis.

In order to make them more widely available, the Pool was reorganized, and the abstracts now appear in a printed bulletin which goes to industrial medical officers as well as to research centres. A special co-operative arrangement has been made with the International Industrial Health and Safety Information Centre in Geneva. [1])

(b) A parallel section of the Pool was set up in 1964 to deal with *burns*, a subject on which much is at present being written in different parts of the world.

(c) With regard to *industrial physiology and psychology* special co-operation has been maintained with the Centre in Geneva ever since it was set up. [1]) In 1965 the High Authority further established an Ergonomic Documentation Centre to exploit relevant literature, notably from non-Community sources such as the United States, Scandinavia and the Eastern European countries, and to compile specialized documentary studies, while in addition an expert working party has been analysing and evaluating scientific literature on the subject of industrial safety.

Distribution of reprints

Under the contract signed with the researchers it is assisting, the High Authority is entitled to receive a number of special reprints of their published work from the publishers. Several hundred are distributed every year to those concerned with industrial medicine and safety. They have been warmly welcomed by researchers, who can very well turn them to good account; numerous centres and scientific bodies both inside and outside the Community have written asking to be sent them regularly. Within the industries also they have been received with much interest; however, they sometimes go into more technical detail than is necessary from the practical user's point of view, so that many users prefer the High Authority's other methods of disseminating information.

Covering reports

These do not describe in detail the different projects sponsored, but provide an overall picture of the research carried out onder a particular grogramme or in a particular field. Any study, even quite an ambitious and expensive one, can after all comprise only a limited number of observations, and the research centres' reports and any articles published on the subject in the specialized press often give only the main substance of the results, without exploring the further implications, so that the broader conclusions are arrived at largely by a process of cross-checking and comparison.

The experts appointed to follow the progress of the different projects as rapporteurs are usually also put in general charge of the work of compiling the covering reports in their respective fields.

The first covering report drawn up was on the High Authority's first programme dealing with industrial medicine, and was issued in its Industrial Health and Medicine series. Others are in preparation on traumatology and rehabilitation, human factors affecting safety, and dust prevention and suppression in mines and in the iron and steel industry.

[1]) The Centre was instituted in 1959 by the International Labour Office and the International Social Security Association.

Monographs and registers

(a) Some material prepared primarily to aid co-operation in a field of direct concern to both researchers and research users is considered sufficiently important to be issued *in extenso* in the four Community languages. The following have already appeared in the Industrial Health and Medicine series :

"*Aide-mémoire* on Spirographical Pratice";

"Pneumoconiosis";

"Catalogue of Atmosphere-Recording Instruments."

Other works are in preparation.

Studies are also being compiled in the Industrial Psychology and Physiology series on

human factors and safety (a record of research to date);

industrial-psychology departments in the Community mining and iron and steel industries.

(b) In addition, both for its own convenience and for the information of its expert advisers, the High Authority has found it necessary to draw up a number of registers of research centres, giving particulars of their articles of association, organizational set-up, specific fields covered and so on. The following are currently in preparation:

a register of centres conducting research on industrial medicine;

a register of centres conducting research on traumatology, rehabilitation and burns;

a register of centres conducting research on industrial psychology and physiology.

Dissemination of information to encourage practical application

In the case of research on new or improved equipment, since the High Authority's object is to see that the equipment in question duly becomes available to those concerned in the Community industries, appropriate provision is made in the contracts with regard to patenting and licensing.

Research results on the biological and human-engineering side, however, are more difficult to translate direct into practice. A process of adjustment, effected jointly by the researchers and the users, is generally required between the end of the research proper and the beginning of the application: the period specified in the contract represents a stage in the work, and the expiry of the contract does not usually mark the completion of the whole, only a stage in that completion. The experts responsible for occupational health and safety have to be given the opportunity to consider the findings, discuss them in the light of their experience in such matters, draw the appropriate practical conclusions and pass these on to the various quarters concerned. This the High Authority does by convening meetings of scientists, research users in the industries, Government experts and others (see below). Also, it issues popular brochures specially compiled for miners and steelworkers, describing research results in particular fields, such as pneumoconiosis, work at high temperatures, and so on.

2. *ORGANISATION OF MEETINGS BETWEEN SCIENTISTS AND OTHERS*

The High Authority arranges various types of forum for these complex and difficult but obviously essential exchanges.

Meetings between scientists and Government experts

Government experts are interested first and foremost in research likely to yield useful data for purposes of factory inspection and regulation of working conditions.

Meetings between scientists and specialists from enterprises

These commonly take place at sessions of the "practical information groups" of colliery and steelworks doctors, engineers and psychologists. The latter act as a link between the research end and the work of the enterprises; in particular, they are able to form an idea as to the value of the research findings and consider what openings there are for adopting them in practice at enterprises.

Meetings with experts from the employers' and workers' associations

These experts are especially versed in all matters on the medico-social and the technical and administrative sides, and accordingly play a particularly important part in ensuring that the data obtained by research are put to practical use.

Broader-based meetings (information sessions)

These sessions take place at a later stage in the proceedings, after the findings in a particular area of research have been considered and discussed with the Government experts, the specialists from the enterprises and the employers' and workers' experts. The rapporteurs of the Research Committees attend, and others invited include members of the appropriate High Authority and European Parliament committees and of the Consultative Committee, E.E.C. and Euratom representatives, experts from third countries and representatives of the intergovernmental organizations.

The majority of those present on these occasions are enterprise medical officers and health and safety engineers, industrial health inspectors and employers' and workers' delegates, who are given accounts by the scientists of the latest advances in research.

In this way various new facts and concepts are put forward in accordance with a procedure which still allows adequate scope for discussion. The information sessions are sometimes for specialists and sometimes for comparative non-specialists. By the interest they evoke in the different quarters concerned, they make a constructive contribution to the preparation of new measures to improve standards of personnel health and safety in the E.C.S.C. industries

Area-level meetings

To assist the work of the national bodies concerned (employers' federations, trade unions, technical associations and so on), the High Authority helps them to arrange seminars on objects which have figured in E.C.S.C. research programmes. At these rappor-

teurs brought in by the High Authority describe research results direct to groups of miners, steelworkers, engineers, technicians or workers' helegates from a given producer area.

In the past two years some ten such seminars have been organized in different Community countries.

V.

SUBJECTS DEALT WITH

As the programmes have grown in size and number they have come to be grouped under three main heads:

(1) physiopathology and rehabilitation;

(2) industrial physiology and psychology;

(3) industrial health.

Annex 3 lists in full the subjects which have been, are being and are to be studied: the following is intended merely to give a general outline conspectus of the research sponsored.

More than 700 projects were carried out, by some 200 research centres, between 1955 and 1964, with the aid of appropriations totalling eight million E.M.A. (dollar) units of account; the appropriations for the programmes undertaken in and after 1964 amount to 15 million units of account, to be spread over a period of four to five years.

PHYSIOPATHOLOGY, TRAUMATOLOGY AND REHABILITATION

In the very extensive field of occupational physiopathology and treatment, the aim has been to delve more deeply into the nature, detection and organic and functional effects of deleterious influences and processes, in order to provide guidance as to prevention and therapy.

With regard to rehabilitation, a big drive is in progress to investigate the best ways of enabling workers who have been injured in industrial accidents or contracted occupational diseases to retain and recover their physical and occupational faculties as far as possible.

Physiopathological and clinical studies

Respiratory diseases caused by dust

Inhalation of the dusts released in various mining and steelmaking operations is injurious to health. Outstanding among the possible ill-effects is pneumoconiosis, a generic term for the group of respiratory complaints including, notably, silicosis. Pneumoconiosis impairs the functioning of the respiratory system, is liable to be attended by infections and cardiac complications, and sooner or later undermines the sufferer's working capacity; it is therefore the gravest of the occupational diseases and demands particularly intensive research.

(a) The basic research which the High Authority is aiding is concerned with the following aspects:

  (i) harmfulness of the different dusts and their components, and the body's defences against them;

(ii) nature of the organic degenerations and functional disturbances occurring in pneumoconiosis patients;

(iii) synthetic substances capable of inhibiting the toxic action of dusts;

(iv) part played by poisoning and infection in the progress of pneumoconiosis;

(v) the various methods of treating pneumoconiosis (a"common project").

(b) In the coalmining sector research on pneumoconiosis and other complaints is concentrated on

(i) short- and long-term effects of mixed coal dusts on the lung and respiratory function;

(ii) coalminer's pneumoconiosis (X-ray examinations, functional tests, etc.);

(iii) incidence and manifestations of bronchitis and emphysema;

(iv) analysis of selected sample cases from different groups of workers, to establish the degree of respiratory capacity and changes therein in Community colliery personnel (a "joint project");

(v) influence of the state of health of migrant workers on that of other personnel, with special reference to hookworm.

(c) In the iron-ore sector research is mainly on

(i) nature and noxiousness of iron-ore dusts;

(ii) iron-ore miner's pneumoconiosis (X-ray examinations, functional tests, etc.);

(iii) incidence and manifestations of bronchitis and emphysema (a "joint project," coupled with a Community-wide epidemiological survey).

In addition, a large number of studies on such aspects as the ill-effects of noise and of various toxic agents have been conducted in other industries with an eye to the application of the findings in the iron-ore industries.

(d) In the iron and steel sector attention is being devoted to

(i) nature and noxiousness of dusts released in the various operations which are liable to produce specially large amounts of dust (*e.g.* furnace lining, sintering);

(ii) incidence and manifestations of bronchitis and emphysema.

In the course of the pneumoconiosis research it has been noticed that the diseases of this type are frequently associated with another complaint, *e.g.* bronchitis-cum-emphy sema. Recent observations have shown that miners and steelworkers do also develop the latter alone, and detailed statistical studies are in progress to establish the relations between it and dust and other occupational factors.

A number of projects are in hand on improvements to the methods used in examining and testing subjects and interpreting the results, to assist the evaluation of functional capacities in the issuing of medical certificates and the prescribing of treatment.

Effects of gases and other harmful substances

Research is being devoted to the gases and fumes liable to be encountered in coal and iron-ore mines and in the iron and steel industry. Aspects dealt with include

(a) effects on the human organism of toxic fumes produced during welding;

(b) ill-effects of scarfing;

(c) effects of agents used in lining ingot-moulds and ladles.

A project concerning the sequelae of acute poisoning by, *inter alia*, carbon monoxide is about to be begun.

Effects of heat

Researchers have been working on the atmospheric factors giving rise to heat stresses, and physiological reactions in men working at high temperatures.

As these reactions vary from one indidual to another, the research has been on a wide scale, covering such aspects as tolerance thresholds in underground mining operations, training of rescue men under the special conditions of high-temperature workings, and improvements in protection against heat in the iron and steel industry.

Protection of workers' health and safety against the effects of heat has been included since 1964 in the special ergonomics programme (see below).

Effects of noise

Here the object has been to pinpoint the components of noise and its physiological and psychological repercussions on miners and steelworkers, and to devise improved means of prevention.

This research also has since been included in the ergonomic programme, with emphasis primarily on prevention.

Rehabilitation of workers injured in industrial accidents or suffering from occupational diseases

This research, carried out on behalf of workers in the three E.C.S.C. industries, is of three main kinds.

Accidents to the cerebro-spinal axis and limbs

One set of projects has been concerned with sequelae liable to prevent the lesion from healing and interfere with rehabilitation (*e.g.* osteoporosis), and the appropriate treatment of these. Another has sought to develop methods of functional retraining designed to anticipate, correct and compensate the disabilities arising out of the injury. A third series was undertaken with the object of assessing the results of rehabilitation in selected categories of injured workers, in order to establish the conditions likely to help or to hinder a return to some form of work.

The findings in these connections are to be taken as the basis for further research specifically on occupational rehabilitation, taking due regard of the special features of the E.C.S.C. industries and aimed at working out rehabilitation and re-employment criteria for practical use there.

Chronic diseases of the respiratory system

Rehabilitation research in this field has been concentrated on the part played by various physiological and pathological mechanisms in the causation of the respiratory impairment found in sufferers from pneumoconiosis and emphysema. The impairment is partly due to allergies and infections which can be effectively coped with; the patient's respiratory functions can then be improved by physiotherapy. Auxiliary breathing apparatus has proved most helpful in dealing with acute respiratory and circulatory difficulties.

Further research on these points is now in progress on the physiopathological/clinical side.

Burns

Attention here is devoted, firstly, to the actual burn and state of the surrounding tissues, and secondly, to the side-effects on the organism as a whole. The latter were long supposed to be the result of some kind of poisoning, but it has never been shown that any specific poison is produced: "burns disease" has in fact been found to be traceable to

(a) infection of the tissues surrounding the burn, leading to the release of bacterial toxins and a consequent persistent danger of septicaemia (the most frequent cause of death in the later stages);

(b) further progress of lesions in the international organs (primarily the kidneys) following the initial shock;

(c) development of metabolic disturbances, especially with regard to proteins and fats.

Research on treatment has shown the very great importance of careful resuscitation for prognosis. Some drugs and forms of medico-surgical treatment, the indications and effects of which have been investigated, are valuable in dealing with metabolic disturbances, while oxygen exposure is helpful in combating infection.

However, with extensive deep burns the patient's recovery depends on the restoration of the skin surface lost. The researchers have been endeavouring to improve the take of grafts from the patient's own body, and to work out where and how it is possible to use skin from donors. Biological studies have demonstrated that the latter method is feasible; it has been found thet there are various ways of treating the graft itself and medicating the patient by which the life of the skin transferred can be quite considerably prolonged.

Further research now in preparation should result in more progress along these already eminently worth-while lines.

Industrial physiology and psychology

These studies, which again cover the three E.C.S.C. sectors, coal, iron-ore and iron and steel, fall into two main categories:

(a) research on *occupational safety*, in which the circumstances and factors liable to affect the environment, the performance of the job, the working conditions and/or the personnel are investigated with a view to reducing the possibility of accident to a minimum;

(b) research on the *improvement of working conditions* by means of ergonomic studies and applications designed to ensure that the men are better adjusted to their jobs and the jobs to the men.

Human factors and safety

(a) In the research on human factors and accident prevention, a comprehensive approach has been adopted, viewing ohe subject as an integrated whole and transcending the frontiers of earlier studies in this connection, which tended to be undertaken somewhat piecemeal. The concept of "human factors" has from the outset been taken in its fullest sense, as connoting not merely individual physical and mental considerations but all factors going to make up the material and psychological background to human work. The term "accident" is also taken in its broadest sense to refer to any interference with the normal progress of operations which could be harmful to personnel, to equipment or to the materials being handled.

The factors to be investigated have been grouped under three heads:

(i) factors concerning the individual alone;

(ii) factors related to conditions in the industry concerned (physical and psychological environment, work organization and job adaptation, personnel selection and training, etc.);

(iii) factors related to lafety precautions as such (safety departments, rules and instructions, individual safety equipment, facilities for inculcating safety-mindedness).

(b) To begin with research was focused on

(i) individual accident-proneness: it was felt that the somewhat sketchy studies mostly carried out hitherto in this connection needed to be undertaken afresh with the benefit of fuller statistical documentation and interdisciplinary co-operation;

(ii) personnel selection and training: it was becoming necessary to verify the practical effectiveness of current methods and where appropriate devise new ones more in line with the requirements of accident prevention;

(iii) role of work organization: the tremendous strides in technology in some industries have made job organization and regulation of the amounts, standards and rhythm of work still more important from the point of view of safety;

(iv) role of the psychological and sociological conditions obtaining in the occupational environment, including in particular make-up of crews; reception and stabilization of personnel, and industrial relations;

(v) individual protective equipment, and more especially practical problems involved in its use;

(vi) circumstances in which accidents originate (a "common project" of pure research).

(c) Subsequently some of these matters were gone into in greater detail, namely

(i) personnel selection and occupational guidance, with special reference to certain physiopathological aspects and to the guidance and employment of physically-handicapped, elderly and migrant workers;

(ii) training, with special reference ot its group aspects, to the implications of technological changes, and to the position of migrant workers.

At the same time, other studies were begun, on

(iii) influence of the work load (rate, stress, monotony, alterness), of the allocation of working time and breaks, and, in particular, of continuous operations. Research on the last-mentioned was deemed to be called for more especially in view of the large amount of continuous operation in the mining and iron and steel industries and the employers' and workers' anxiety to ascertain any effects it may have on safety and to secure data which will help to enable the most suitable men to be assigned to such work;

(iv) relations of man to job and job to man: even after everything has been done with regard to technical safety precautions, it is still necessary to adapt jobs, working methods, and even processes, to the physiological and psychological needs of the personnel in such a way that working conditions tend more and more to exclude the contingency of accidents.

Ergonomic studies and job adaptation

It has come to be much more generally realized in recent years that occupational demands must be adapted to human capacities. Basing themselves on pure research into industrial physiology and psychology, on experience and observations assembled in industrial medicine, and on engineering techniques, the specialists are engaged in working out such improvements to jobs, operating methods and processes and environmental conditions as will make them as favourable to the health and safety of the worker as the industries can possibly afford.

In the light of the separate research conducted on the various aspects of industrial pathology, it has been decided to undertake two sets of studies on the prevention and correction of undesirable elements:

(a) applied research in the field of ergonomics, aimed at securing optimum adaptation of the main mining and steelmaking jobs involving such stresses as high temperatures, noise, vibration, atmospheric pollution, and psychical or mental strain. This is the more original of the two, since it has been organized specifically with an eye to application at the enterprise itself, and takes particular account of technological progress (mechanization, automation, processes of various kinds): thus it will be of assistance both in putting existing conditions to rights and in devising improved equipment and new processes;

(b) pure research on the relationship between the worker and his work, including such aspects as the short- and long-term physiological and psychological demands and

effects of the job, the relation of age to working capacity, possible ways of reducing stresses due to heat, sound and vibration, the amount and nature of the mental activity involved, and the possibility of adapting perceptional and sensory stresses.

Industrial hygiene

Alongside the longer-term medical, physiological and psychological research in progress, a big drive has been undertaken with regard to technical control. These activities were originally confined to dust prevention and suppression, principally in the two mining industries, dust being a major source of disease and of accidents; later the terms of reference were broadened to include the control of the various types of air pollution by dusts, fumes and gases in the iron and steel industry.

Dust prevention and suppression in the mines

(a) In the initial stage research was concentrated on

(i) improved investigation of dustiness levels, achieved by devising better methods of measuring dusts and by studying the characteristics and behaviour of dusts below ground;

(ii) improved technical control below ground during or prior to the different operations;

(iii) improved knowledge of the actual exposure to dust on the part of personnel.

(b) Since then, while research in these directions was continued, attention has come more particularly to be devoted to

(i) active dust prevention and suppression in large-capacity, usually highly-mechanized workings (though there is no intention of neglecting the more traditional type of operation or working) by such methods as water infusion in the seam. This latter process has in the last few years been adopted as the basis of all dust suppression at the coalface: nevertheless, with the development of the mechanized high-speed face it has become necessary to make drastic changes in the original concept,imposing a very tight schedule for the carrying-out of the infusion.

In addition, special attention is being paid to dust suppression during winning with high-powered modern machinery, and during such other operations as shotfiring, stowing and caving, roadway drivage and so on. One series of projects is concerned with the specific problems arising in iron-ore mining;

(ii) development of accurate but sturdy dust-recording instruments for regular use in workings;

(iii) development of accurate methods for determining the exact composition of dusts;

(iv) ongoing statistical studies on possible relations between working conditions below ground and the appearance and progress of pneumoconiosis.

Dust and air-pollution control in the iron and steel industry

(a) To start with the focus was on

(i) reducing dust production in various operations connected with steelmaking, such as furnace and ladle maintenance, burden preparation, sintering and charging, and in particular reducing the amounts of dust and fumes given off in oxygen steelmaking;

(ii) providing protection against dusts and fumes, especially at the actual furnaces;

(iii) co-ordinating methods of dust measurement and determining degrees of dust exposure.

(b) The research was subsequently extended to cover emissions of noxious gases and the effects of the various types of pollution both inside the plant and round about. These more recent studies, which include both pure and applied research, have been undertaken

(1) to establish the nature and extent of air pollution inside and outside the plant;

(2) to devise new or improve existing processes, installations, appliances or products for

(i) preventing or restricting the production of dusts, fumes and gases,

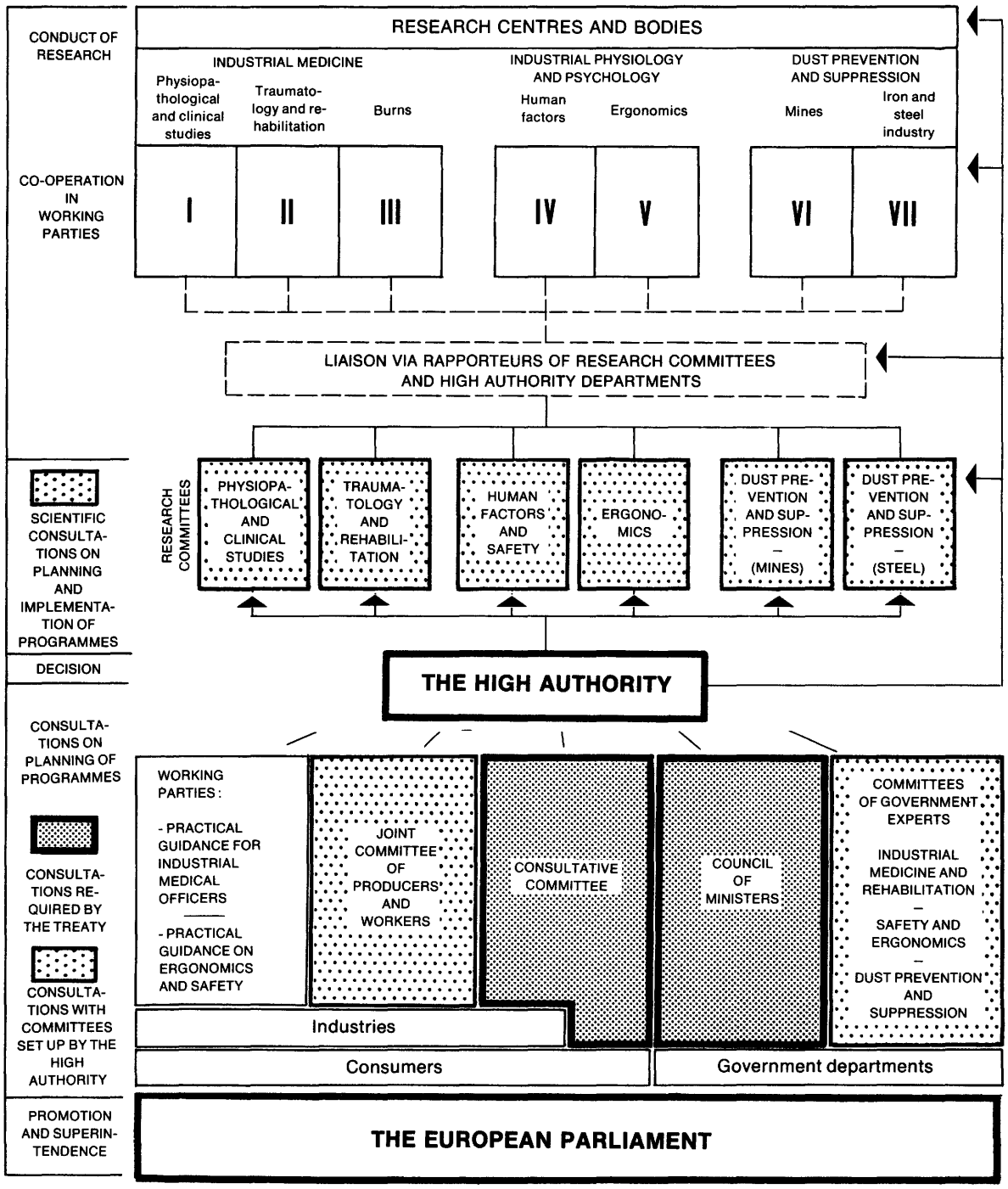
(ii) rendering less harmful those which are bound to be produced in certain operation (*e.g.* by substituting safe or comparatively safe substances for certain definitely dangerous ones now in use),

(iii) trapping and precipitating them as and where produced or nearby,

(iv) providing individual protection against them for men obliged to work where they are present to an extent constituting an inconvenience or actual danger.

ANNEXES

ORGANIZATION CHART



WORKING PARTIES

I. Pure research on pneumoconiosis
Haemodynamics and technology
Respiratory exchange and diffusion
Standardization of functional tests
Epidemiology, prophylaxis and treatment
Radiological diagnosis
Toxic gases
Documentation : Pneumoconiosis

II. Biological and physiopathological problems resulting from injuries
Rehabilitation of victims of brain injuries
Rehabilitation of victims of spinal injuries
Rehabilitation of workers having suffered injury to or amputation of a limb

III. Biological and physiopathological problems resulting from burns
Clinical problems resulting from burns
Immunological compatibility and homograft tolerance
Documentation : Burns

IV. Personnel selection and vocational guidance
Training
Individual protective equipment
Work load
Working environment
Community-level research on safety
Documentation : Human Factors

V. Pure research on industrial physiology and psychology
Continuous operation
Work at high temperatures
Work amid noise/vibration
Stresses caused by static effort
Mental requirements of jobs
Age and work
Industrial applications of ergonomies
Documentation : Industrial Psychology and Physiology

VI. Dust measurement (Mines)
Dust prevention and suppression at the face
Dust prevention and suppression outby the face
Pneumoconiosis and environmental factors (Mines)

VII. Pure research on measurement of dusts and gases (Steel)
Control of brown smoke
Control of dusts, gases and fumes other than brown smoke

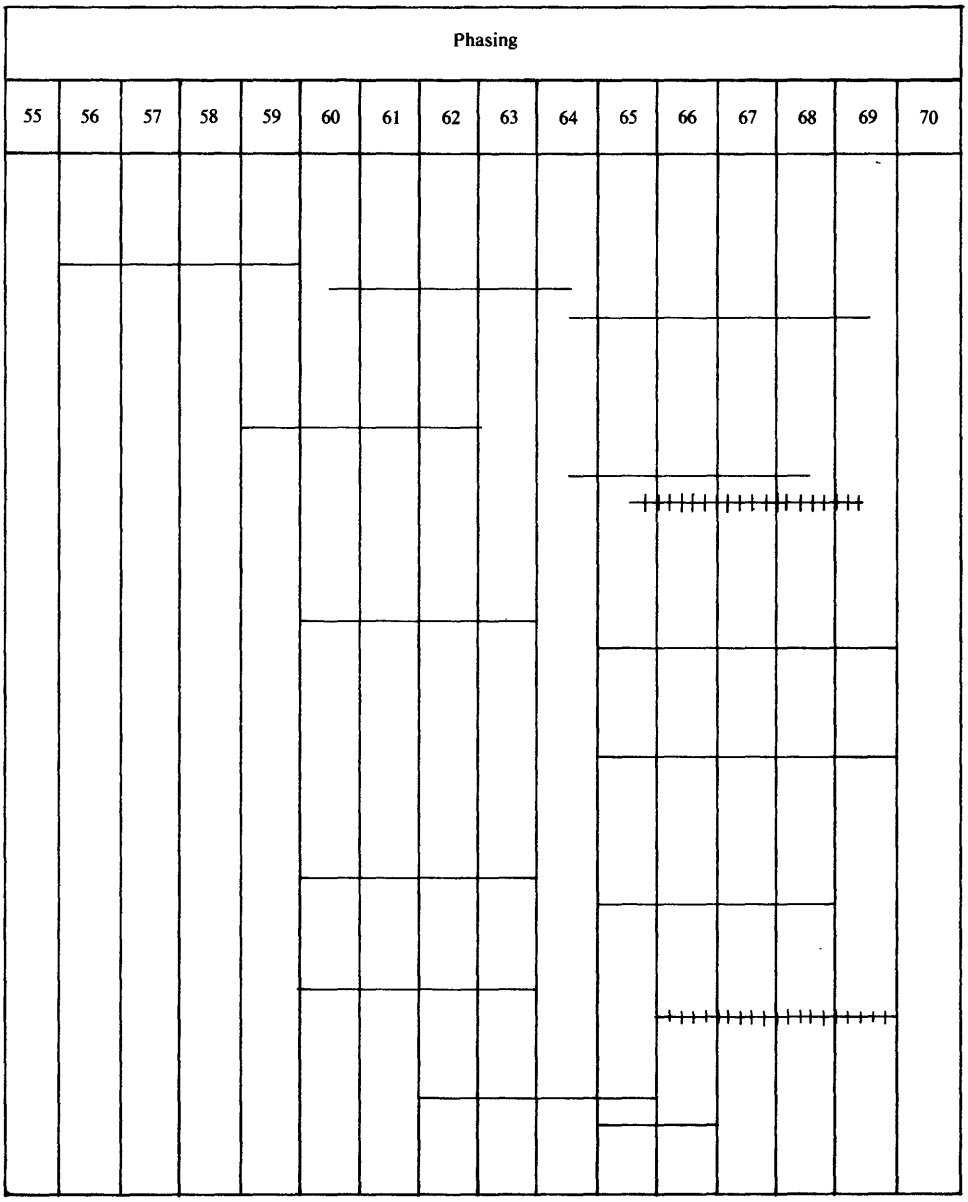
ANNEX 2

RESEARCH PROGRAMMES ON INDUSTRIAL MEDICINE, HEALTH AND SAFETY, as at October 31, 1965

Research area and subject of programme	When approved	Financing (in $ units of account, rounded)	
		Total appropriation	Amount committed
A. Industrial medicine			
(a) Physiopathological and clinical studies			
1st programme (industrial medicine)	5.10.55	1,200,000	1,200,000
2nd programme (industrial medicine)	7.04.60	2,800,000	2,680,000
3rd programme (physiopathological and clinical studies)	19.06.64	3,000,000	1,670,000
(b) Traumatology and rehabilitation			
1st programme (rehabilitation)[1]	5.12.57	500,000	500,000
2nd programme (traumatology and rehabilitation)	19.06.64	1,800,000	25,000
3rd programme (burns)			
B. Industrial physiology and psychology			
(a) Human factors and safety			
1st programme[1]) (human factors and safery)	5.12.57	1,000,000	1,000,000
2nd programme[2]) (human factors and safety)	4.11.64	1,200,000	9,000
(b) Ergonomics			
1st programme (industrial physiology and psychology and job adaptation)	4.11.64	2,000,000	166,000
C. Industrial health			
(a) Dust suppression in mines			
1st programme[1])	5.12.57	900,000	900,000
2nd programme	21.12.64	6,000,000	3,610,000
(b) Dust suppression in the iron and steel industry			
1st programme[1])	5.12.57	600,000	510,000
2nd programme			
(c) Separate projects			
Brown smoke from converters	18.07.61	1,000,000	800,000
Brown smoke from converters	19.06.64	1,825,000	–
		23,825,000	13,070,000

[1]) Comes under a combined financing arrangement covering four programmes, which are grouped under the general head "Safety."

[2]) Comes under a combined financing arrangement covering two programmes, which are grouped under the general head "Human Factors and Ergonomics."


Phasing
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Completed or in hand
In process of administrative preparation

ANNEX 3

SUBJECTS COVERED BY E.C.S.C.-SPONSORED RESEARCH PROGRAMMES

An enumeration follows of the subjects of research completed, in hand and planned.

Of the six sections into which it is divided, I and II concern research on industrial physiopathology and rehabilitation, III and IV research on industrial physiology and psychology and job adaptation, and V and VI research on industrial health. Each section lists first the projects completed, then those in hand, and lastly those in preparation.

Industrial physiopathology and rehabilitation

Section I Research on Industrial Medicine (industrial pathology and physiology)

I a *Research completed under 1st programme on industrial medicine (1956–60)*

I b *Research completed under 2nd programme on industrial medicine (1960–63)*

I c *Research in hand under 3rd programme on industrial medicine (physiopathological and clinical studies)*

Section II Research on Traumatology and Rehabilitation

II *a* *Research completed under 1st programme on industrial medicine (1956–60)*

II b *Research completed under 1st programme on rehabilitation (1960–62)*

II c *Research completed under 2nd programme on industrial medicine (1960–63)*

II d *Research envisaged under 2nd programme on traumatology and rehabilitation*

II e *Research in preparation under programme on burns*

Industrial physiology and psychology

Section III Research on Human Factors and Safety

III a *Research in hand under 1st programme on human factors and safety (1959–63)*

III b *Research in preparation under 2nd programme on human factors and safety*

Section IV Research on Industrial Physiology and Psychology and Job Adaptation

Industrial health

Section V Research on Dust Protection and Suppression in Mines

V a *Research completed under 1st programme on dust prevention and suppression in mines (1960–63)*

V b *Research in hand under 2nd programme on dust prevention and suppression in mines (1965–68)*

Section VI Research on Dust and Air-Pollution Control in the Iron and Steel Industry

VI a *Research completed under 1st programme on dust prevention and suppression in the iron and steel industry (1959–62)*

VI b *Research in preparation under programme on control of air polluents given off in iron and steel production*

Section I Research on Industrial Medicine
(industrial pathology and physiology)

I a Research completed under 1st programme on industrial medicine (1956–60)

A. Pure research on pneumoconiosis

A.1. – Entry of dust via the respiratory passages
A.2. – Isolation of dusts

- A.21. – Methodology
- A.22. – Total amounts of dusts isolated
- A.23. – Properties of dusts isolated
- A.24. – Analysis of dusts isolated

A.3. – The body's reactions to dusts
A.4. – Coalminer's pneumoconiosis

B. Cardiorespiratory physiopathology

B.1. – Methodology and standards
B.2. – Emphysema and chronic bronchitis

- B.21. – Points in functional diagnosis
- B.22. – Etiological factors and emphysema

B.3. – Cardiopulmonary physiopathology in iron-ore miner's and coal-miner's pneumoconiosis
B.4. – Pathological anatomy and emphysema

C. Radiological diagnosis of pneumoconiosis

C.1. – Hard ray technique
C.2. – Detail enlargement processes
C.3. – Radiographic processes
C.4. – Amounts of radiation
C.5. – Microradiography
C.6. – Classification of silicosis

D. Pneumoconiosis in the iron-ore and iron and steel industries

D.1. – Pneumoconiosis in iron-ore miners

- D.11. – Chemical and mineralogical analysis of dusts
- D.12. – Study of respirable dusts
- D.12. – Study of radiological characteristics
- D.14. – Study of clinical characteristics

D.2. – Pneumoconiosis in steelworkers

- D.21. – Special types of siderosis and silicosis
- D.22. – Pneumoconiosis in sinter plants

D.23. – Pneumoconiosis in rolling mills
D.24. – Pneumoconiosis caused by refractory bricks

E. Treatment of silico-tuberculosis

E.1. – Treatment of silico-tuberculosis
E.2. – Treatment of confluent forms of pneumoconiosis
E.3. – Bronchitis and pneumoconiosis
E.4. – Surgical treatment of pneumoconiosis

F. Dust measurement

F.1. – Sampling, examination and analysis
F.2. – Experimental reproduction of dust conditions
F.3. – Nature and action of electrostatic charge
F.4. – Quartz content of dusts in relation to particle size
F.5. – Study aimed at improving particle-size analysis of dusts
F.6. – Use of infra-red spectroscopy to determine silica content
F.7. – Sampling of dusts over an extended period

G. Carbon-monoxide poisoning

G.1. – Methods of measurement
G.11. – Measurement of atmospheric CO
G.12. – Measurement of blood CO
G.13. – Comparative research on methods of measurement
G.2. – Physiopathology of carbon-monoxide poisoning
G.3. – Research on experimental poisoning in animals

H. Work at high temperatures

H.1. – Physiological principles of work at high temperatures
H.2. – Measurement and evaluation of ambient atmosphere
H.3. – Measurements recorded in mines and iron and steel plants
H.4. – Improvement of ambient atmosphere below ground
H.5. – Protection against radiant heat
H.6. – Physiological studies related to ambient temperature
H.7. – Tolerance thresholds for work at high temperatures

I. Noise abatement

I.1. – Measurement of noise
I.2. – Occupational deafness
I.3. – Neurovegetative disturbance caused ny noise
I.4. – Psychological aspects of the effects of noise
I.5. – Noise abatement

K. Pratical guidance for industrial medical officers

K.1. – Classification of matters relevant to industrial medical officiers' purposes
K.2. – Organization of industrial medical services
K.3. – Job discription and analysis
K.4. – Burns in E.C.S.C. industries
K.5. – Survey of hyperthermia syndromes
K.6. – Survey of occupational dermatoses
K.7. – Research and industrial medicine
K.8. – General report on an Information Session on pneumoconiosis

I b Research completed under 2nd programme on industrail medicine (1960-63)

L. Pure research on pneumoconiosis

L.1. – Bronchial elimination and pulmonary retention
L.2. – Action of silica on cells and tissue cultures
L.3. – Immunity phenomena in the pathogenesis of silicosis
L.4. – Morphological characteristics of the reaction of tissues to quartz, and metabolic degenerations caused thereby
L.5. – Morphological, chemophysical and physicopathological research on experimental silicosis in various animals
L.6. – Conditions determining susceptibility to silicosis
L.7. – Pathogenic action of mixed dusts
L.8. – Substances inhibiting the progress of silicosis

M. Cardiorespiratory physiopathology

M.1. – Ventilation

M.11. – Standardization of measurements of residual volume and of uneven distribution
M.12. – Survey of effort tests
M.13. – Calibration of ergometers
M.14. – Standardization of aerosol appliances
M.15. – Kymographic analysis of ventilation
M.16. – Pulmonary volume and output in pneumoconiosis cases
M.17. – Broncho-pulmonary irritability
M.18. – Effects of dusty works on ventilation
M.19. – Mechanics of ventilation and the work of breathing

M.2. – Alveolo-respiratory function

M.21. – Methods and techniques
M.22. – Alveolo-respiratory function in pneumoconiosis and chronic pulmonary cases

M.3. – Circulatory function

M.31. – Methods and techniques
M.32. – Origin of the various types of circulatory irregularity
M.33. – Ergospirometry: techniques and case studies

N. Radiological diagnosis

N.1. – Improvement of the 10x10 radiophotographic process and comparison with the larger format
N.2. – Use of the ultra-hard-ray technique in examining for silicosis
N.3. – Radio-anatomical comparison in the study of pneumoconiotic background
N.4. – Radiological processes for the representation of Gough sections
N.5. – Comparison of pulmonary ventilation with the different stages indicated in the new international classification (Geneva 1958)
N.6. – Illustration of the new international classification by radiographs of typical pneumoconiotic lesions

O. Treatment and prophylaxis of cardiorespiratory diseases

O.1. – Exchange of observations on the treatment of respiratory diseases, including in particular chronic bronchitis, emphysema and cor pulmonale
O.2. – Treatment of chronic bronchitis accompanied or unaccompanied by silicosis
O.3. – Treatment of closed silico-tuberculosis
O.4. – Treatment of open silico-tuberculosis
O.5. – Exchange of observations on tuberculins
O.6. – Prophylactic treatment with BCG
O.7. – Prophylactic treatment with INH
O.8. – Exchange of observations on predispositions to chronic bronchitis, bronchial asthma, emphysema and silicosis

P. Bronchitis/emphysema

P.1. – Etiological and physiopathological factors in emphysema
P.2. – Clinical aspect of chronic bronchitis and emphysema

P.21. – Anamnesis
P.22. – Physical diagnosis
P.23. – Eosinophilia of the blood
P.24. – Examination of sputum
P.25. – Examination of allergy
P.26. – Increased reaction of the bronchial tree to acetylcholine or histamine
P.27. – Increased reaction to bronchodilator agents
P.28. – Radiological examination
P.29. – Functional examination

P.3. – Epidemiological studies
P.4. – Experimental research on dusts

Q. Gases and fumes

Q.a. – Acute, subacute and chronic carbon-monoxide poisoning
- Q.a.1. – Measurement of atmospheric and blood CO
- Q.a.2. – General etiology of CO poisoning
  - Q.a.21. – Behaviour of CO in the blood
  - Q.a.22. – Normal level of carboxynaemia
- Q.a.3. – Acute CO poisoning in man and the problem of chronic CO poisoning in man
- Q.a.4 – Experimental methods with regard to acute and chronic CO poisoning
- Q.a.5. – Physiological and anatomo-pathological effects observed following experimental acute and subacute CO poisoning
  - Q.a.51 – Physiological and anatomo-pathological effects observed following experimental chronic CO poisoning
  - Q.a.52. – Haematological and biochemical effects of CO
  - Q.a.53. – Effects of CO on enzymes
  - Q.a.54. – Pathogenesis of syndromes caused by CO
- Q.a.6. – Treatment of CO poisoning

Q.b. – Other gases and fumes
- Q.b.1. – Methods of measurement
- Q.b.2. – Sulphur dioxide (SO_2) and sulphur trioxide (SO_3)
- Q.b.3. – Nitrous fumes
- Q.b.4. – Ammonia
- Q.b.5. – Smoke from electric-arc furnaces
- Q.b.6. – Coke-oven gas
- Q.b.7. – Gases in iron-ore mines
- Q.b.8. – Possible carcinogenic and cocarcinogenic properties of certain smokes
- Q.c.9. – Gas mixtures in general

Q.c. – Dust-laden gases

R. Work at high temperatures

R.1. – Effects of ambient temperature on different bodily functions
- R.11. – Circulation
- R.12. – Kidneys
- R.13. – Metabolism of water and electrolytes

R.2. – Anatomo-pathological changes produced by hyperthermia
R.3. – Effects of heat stress on working capacity
R.4. – Local effects of radiant heat
R.5. – Individual differences in heat tolerance
R.6. – Equivalences of differently-constituted atmospheres
R.7. – Process of recovery following hot work
R.8. – Measures to prevent undesirable atmospheric influences
R.9. – Incidence of ailments caused by heat among workers employed on hot jobs

S. Noise

S.1. – Apperception of the spoken word on jobs

S.11. – Relations between masking effects and intermittent noise
S.12. – Role of frequency bands for the comprehension of the spoken word
S.13. – Role of the acoustic value of the speaking voice

S.2. – Occupational deafness

S.21. – Relations between threshold of hearing and future deafness
S.22. – Effects of extra-auricular excitations on auditory fatigue

S.3. – Somatic effects of noise

S.31. – Effects of acoustic excitation on metabolism
S.32. – Effects of continuous and intermittent acoustic action on the cardiovascular system
S.33. – Role of the information conveyed acoustically in triggering off stresses
S.34. – Secondary vegetation reactions caused by industrial noise
S.35. – Role of ultrasonics

T. Practical guidance for industrial medical officers

T.1. – Study of aspects of ergonomics
T.2. – Study of inter-enterprise medical services

c Research in hand under 3rd programme on industrial medicine (physiopathological and clinical studies) (1964-69)

PROGRAMME BY DIRECT ARRANGEMENT

U. Serious respiratory complaints occurring in E.C.S.C. workers

U.1. – Pure research on pneumoconiosis

U.11. – Elimination and retention of dusts by the lung
U.12. – Harmful effects of silica dusts and mixed dusts on cells and tissues
U.13. – Substances inhibiting the ill-effects of dusts
U.14. – Role of infections in the progress of pneumoconiosis
U.15. – Role of poisoning in the progress of pneumoconiosis
U.16. – Factors conditioning sensitivity or resistance to the action of dusts

U.2. – Clinical, radiological, functional, therapeutic and prophylactic research on respiratory complaints (including more especially pneumoconiosis and bronchitis/emphysema

U.21.1. – Community-level "joint project": epidemiological, clinical, radiological and functional examination of sample groups of workers selected in accordance with agreed criteria, to establish the degrees of working capacity in E.C.S.C. workers (including pneumoconiosis in the steel industry)

U.21.2. – Studies on standardization of cardiorespiratory functional tests (residual volume, uneven distribution of inspired gas, effort tests, cardiorespiratory function)

U.21.3. – Studies on improvements to radiological examination for pneumoconiosis and dust adsorption

U.21.4.a. – "Joint project" on prophylaxis of tuberculosis in pneumoconiosis cases

b. – Research on meausres to prevent young miners from contracting tuberculosis or pneumoconiosis accompanied by tuberculosis

U.21.5. – "Joint project" on the various methods (medicinal, physical and psychosomatic) of treating pneumoconiosis

U.21.6. – Studies on respiratory complaints resulting from the use of refractory bricks in blast-furnaces and steelworks

U.21.7. – Studies on respiratory complaints resulting from the handling of sinter, at sintering plants and blast-furnaces

U.21.8. – Studies on the etiology and pathogenesis (including the constitution) of bronchitis and emphysema in E.C.S.C. workers, and the various methods (medicinal, physical and psychosomatic) of treating them

U.21.9. – "Joint project" on the epidemiology and phophylaxis of bronchitis and emphysema in E.C.S.C. workers

V. Effects of gases and other harmful substances

V.1. – Effects on the human organism of toxic fumes produced during welding

V.2. – Ill-effects of scarfing

V.3. – Effects of agents used in lining ingot-moulds and ladles

PROGRAMME BY PUBLIC TENDER

W. Clinical, radiological, functional, therapeutic and prophylactic research on respiratory complaints (including more especially pneumoconiosis and brochitis/emphysema)

W.1. – Anatomo-pathological research on pneumoconiosis and other pulmonary lesions occuring in coalminers

W.2. – Research on improvements to methods used in examining and testing subjects and interpreting the results, to assist the evaluation of functional capacities in the issuing of medical certificates and the prescribing of treatment

W.3. – Functional, radiological, therapeutic and prophylactic research on cardiocirculatory complications in chronic lung cases

W.4. – Comparative anatomo-clinical and etiological research on chronic broncho-pulmonary complaints occurring in E.C.S.C. workers

X. Effects of gases and other harmful substances

X.1. – Sequelae of acute poisoning, especially by carbon monoxide

Section II: Research on Rehabilitation, Traumatology and Burns

II a *Research completed under 1st programme on industrial medicine (1956-60)*

A.1. – Survey of rehabilitation methods used in the United States and Canada

A.2. – Psychological problems arising in the rehabilitation of casualities

A.3. – Surgical treatment of traumatic paraplegias

A.4. – Treatment and rehabilitation of casualities with deep hand burns

II b *B.1.* – *Rehabilitation of workers suffering from traumatic sequelae*

B.11. – Injuries to the vertebral column and spinal cord

B.111. – Pure research on paraplegia in animals

B.112. – Research on the current physical condition and social circumstances of paraplegics treated and rehabilitated in recent years (particularly in France, Germany and the Netherlands)

B.113. – Research on methods of treatment and re-training

B.12. – Injuries to the trunk and limbs

B.121. – Pure research on knitting of fractures and on adverse after-effects in injured tissues and degenerations in other regions

B.122. – Development of artificial arms suitable for heavy work

B.123. – Research on rehabilitation of persons who have lost an arm or leg

B.13. – Skull and brain injuries

B.131. – Surveillance and treatment of brain injuries

B.132. – Behavioural and personality disturbances in persons with brain injuries

B.133. – Motory retraining techniques

B.2. – Rehabilitation of burns cases

B.21. – Injuries to internal organs, especially the kidneys; progress of renal lesions
B.22. – Metabolic disturbances, "toxic" disorders
B.23. – Clinical and biological manifestations related to infection
B.24. – Skin regeneration in the region of the burn with and without the aid of grafts

B.3. – Rehabilitation of silicosis and emphysema cases

B.31. – Proximate causes of respiratory insufficiency
B.32. – Improvement of patients' condition by combined medicinal and physical treatment

II c *Research completed under 2nd programme on industrial medicine (1960-64)*

C.1. – Physiopathology and general treatment of burns cases

C.11. – Diagnosis and compensation of fluid losses
C.12. – Treatment of metabolic disturbances
C.13. – Feeding of burns cases
C.14. – Causes of death in the late or semi-late stage
C.15. – Exception of life and mortality in badly-burned subjects

C.2. – Local treatment of burns; grafts

C.21. – Causes of failure of autologous grafts
C.22. – Isolation and identification of skin antigens causing rejection of homologous grafts
C.23. – Prevention of rejection of homologous grafts by preparation of the graft or of the patient
C.24. – Tissue reactions accompanying rejection of homologous grafts
C.25. – Causes, prevention and treatment of scar retractions

II c *Research envisaged under 2nd programme on traumatology and rehabilitation (1965-68)*

D.1. – Limb injuries

D.11. – Physiopathological studies (difficulties in bone consolidation, vascular, nervous and trophic diorders)
D.12. – Rehabilitation of persons having lost a limb (including use of protheses and occupational retraining of persons equipped with them)
D.13. – Hand injuries (surgery and retraining)
D.14. – Traumatic articular lesions (treatment and retraining)
D.15. – Psychological studies

D.2. – Cranial and spinal injuries

D.21. – Pure research on biological and metabolic disorders
D.22. – Post-traumatic syndrome in patients with injuries to the skull (with special reference to the prevention of post-traumatic disturbances)

D.23. – Social and occupational rehabilitation of paraplegics
D.24. – Neck injuries
D.25. – Complications in simple fractures of the rachis

D.3. – Chest injuries

D.31. – Treatment and retraining

II e *Research in preparation under programme on burns*

E.1. – Physiopathology and general treatment of burns cases

E.11. – Distribution of fluids and electrolytes in the body following the burn
E.12. – Therapeutic control of diuresis, metabolic disturbances and infection
E.13. – Secondary renal complications
E.14. – Feeding of burns cases

E.2. – Local treatment of burns; grafts

E.21. – Study of region to receive the graft
E.22. – Improvement of efficacy and reliability of autologous grafts
E.23. – Prevention of rejection of homologous grafts by selection of the most compatible donor and appropriate treatment of the patient

E.3. – Rehabilition of burns cases

E.31. – Cicatrization of burns
E.32. – Functional and plastic surgery to face and hand burns

Section III: Research on Human Factors and Safety

III a *Research completed under 1st programme on human factors and safety (1959-63)*

A.1. – Research comprised in the outline programme

A.11. – Effects of individual physiological and psychological factors on safety
A.12. – Analysis of certain aspects of the job: organization and cohesion of the team, gang, crew or other working unit, transmission of information, liability of monotony resulting from automation to impair quickness of reaction in an emergency
A.13. – Inventory and analysis of personnel selection and training methods used in the mining and iron and steel industries, and checking of their effects as regards safety
A.14. – Protective equipment: its suitability for the user; procedure for issuing it; conditions of use; factors promoting its acceptance and use, including in particular individual and group attitudes to it and to safety in general

B. – *Community-level research on safety*

This "Joint project" of pure research covered the whole field of circumstances leading up to the occurrence of accidents. It was carried out over a period of three years in 11 Community mines and steel plants, by research teams each made up of an engineer, a doctor and a psychologist, the High Authority being responsible for the overall co-ordination.

These separate studies have now been completed and the covering report is in preparation.

III b *Research in hand under 2nd programme on human factors and safety (1965-69)*

C.1. – Assessment of degree of safety and individual and collective prerequisites for success

C.2. – Personnel selection and job assignment with reference to safety

- C.21. – Physiopathological aspects of selection and job assignment (especially infra-clinical conditions)
- C.22. – Problems presented by the occupational guidance and reassignment of physically and/or psychically-handicapped workers
- C.23. – Problems concerning migrant workers
- C.24. – Survey of selection and occupational guidance methods used in the mining and iron and steel industries

C.3. – Occupational training as it affects safety (including analysis and assessment of group safety training)

C.4. – Individual protective equipment

- C.41. – Psychological problems involved in the use of individual protective equipment; possible ways of ensuring its wider use
- C.42. – Technological studies to develop models more in line with physiological and operational requirements of miners and steelworkers

C.5. – Work and allocation of working time and breaks as they affect safety

- C.51. – Effects on safety of the work load (amount and rate of activity. stress, monotony, alertness)
- C.52. – Effects on safety of the allocation of working time and breaks (within the daily shift, in the subdivision of the working day, during a regular cycle of shifts)
- C.53. – Effects on safety of continuous operation (selection and training of personnel most suited for such work, influence of age on ability to adjust to it, sociological factors in adjustment to it)

C.6. — Relations between man and job as they affect safety

C.61. — Problems of signal recognition (especially danger signals) amid the existing sensory impact of environmental conditions (noise, vibration, lighting, etc.)

C.62. — Problems of compatibility between operational processes or machine controls and the worker's perceptions and psychomotor faculties (especially reflexes)

C.63. — General problems of work organization and layout (planning of jobs, equipment, premises and so on)

C.64. — Psycho-sociological considerations with regard to the composition, stability and cohesion of crews (especially in the matter of size of crew, alternation of crews in continuously-operating services, and ethnic origin and language of crew members)

C.65. — Leadership, attitude of managerial and supervisory personnel to safety

Section IV : Ergonomic Research

IV a *Research in hand under programme on industrial physiology and psychology and job adaptation*

1. Physiological and psychological demands and effects of work

11. General studies

111. Short-term effects of work (in accordance with the nature of the job, hours worked and amount of effort involved)

(a) Effects of rotation of shifts
(b) Effects of stresses peculiar to the job concerned

112. Industrial fatigue

(a) Effects of the nature of the job, hours worked, amount of effort involved, rhythm of work and working conditions: their detection, prevention and treatment
(b) Psychical manifestations of physical fatigue
(c) Objective elucidation of mental fatigue

113. Long-term effects of work

(a) Effects in certain physically or mentally taxing jobs
(b) Effects on ageing, disability and life expectation (statistical, biological and psychological studies)

12. Specific studies

121. Work at high temperatures

(a) Fitness for work at high temperatures, and criteria for assessing such fitness
(b) Simple method of testing fitness for hot work

(c) Tolerance tresholds in workers on hot jobs in accordance with the ambient conditions (radiation, convection, temperature, humidity, air velocity) and work load

(d) Protection on hot jobs

(i) Environmental precautions: partitions, screens, air conditioning

(ii) Protective clothing: type of fabric, how treated (washing), skin tolerance

122. Work amid noise

(a) Development of a simple audiometric method and apparatus to enable industrial medical officers to make quick and objective examinations

(b) Ways and means of

(i) reducing noise at source

(ii) reducing noise by environmental precautions

(iii) providing individual protection

123. Vibration

(a) Vibrations transmitted to the upper limbs by the different types of miner's pick, and ways of reducing them

(b) Tolerance criteria in respect of vibrations transmitted via the hands

(c) Suspension and seats in mechanical-handling vehicles

124. Working postures

(a) Unaccustomed postures (crouching, kneeling, semi-recumbent)

(b) Static effort, especially in the use of heavy implements such as picks

125. Objective signs of interference with the regulatory mechanisms giving indications as to steelworkers' fitness for work

126. Demands and effects of the mental processes required in the supervision and control of instruments, etc.

(a) Reception and handling of information

(b) Possible adjustments

127. Demands of certain jobs on which age has a specific bearing; possible adjustments to enable the men concerned to remain on these jobs

2. *Job adaptations planned, to be effected in accordance with physiological and psychological requirements, by recourse in particular to interdisciplinary and/or ergonomic studies*

N.B.: The employers' and workers' organizations have listed a number of jobs in the mining and iron and steel industries which call for adaptation in view of the various stresses they involve at present (physical effort, awkward postures, noise, vibration, heat. fumes, airlessness, poor lighting, mental strain, psychological tension, irregular working rhythms, intermittent overwork, etc.). The projected studies in this connection are being specially planned to take account of technological progress in the form of mechanization, automation and the various new processes being introduced.

Section V: Research on Dust Prevention and Suppression in Mines

V a *Research completed under 1st programme on dust prevention and suppression in mines (1960-63)*

1. Development and improvement of dust measurement methods
   - (a) Direct measurement of dustiness levels
   - (b) Sampling techniques
   - (c) Analysis of dust samples
2. Dust production in mines
   - (a) Characteristics of the dusts (*e.g.* mineralogical composition)
   - (b) Properties of the dusts (*e.g.* electrostatic charges)
   - (c) Behaviour of dusts encountered below ground (*e.g.* effects of turbulence, humidity, deposition)
3. Development and improvement of dust suppression methods
   - (a) Water infusion in the solid coal
   - (b) Dust suppression during pneumatic stowing and caving
   - (c) Dust suppression during shotfiring
   - (d) Dust suppression during winning operations
   - (e) Control of deposited dust
   - (f) De-dusting of airflow, especially intake air
   - (g) Dust suppression at highly dust-productive installations (*e.g.* skips, crushers, loading and transfer points)
   - (h) Suppression of dust produced in drilling, especially in connection with roof bolting
4. Protection of personnel against dust (job assignment, investigations based on card-indexed dustiness-level and work records)

V b *Research in hand under 2nd programme on dust prevention and suppression in mines (1965-68)*

1. Dust suppression at the face
   - 1.1. Water infusion in the seam
   - 1.2. Dust suppression in the use of winning and loading machinery and equipment
   - 1.3. Dust suppression during shotfiring at the face
   - 1.4. Dust suppression in face haulage, including transfer at the bottom of the face
2. Dust suppression outbye the face
   - 2.1. Dust suppression during stowing and caving
   - 2.2. Dust suppression in outbye haulage and winding
   - 2.3. Dust suppression in high-speed roadway drivage
   - 2.4. Other dust prevention and suppression methods
   - 2.5. Problems specific to iron-ore mining

3. Measurement of dusts and determination of their characteristics

   3.1. Measurement of dusts
   3.2. Determination of characteristics of dusts

4. Pneumoconiosis and environmental factors

Section VI: Research on Dust and Air-Pollution Control in the Iron and Steel Industry

VI a *Research completed under 1st programme on dust prevention and suppression in the iron and steel industry (1959-62)*

A. Applied research

Development and improvement of processes and apparatus for the following purposes:

1. Dust suppression for the benefit of furnace liners, ladle liners and others regularly handling silica refractories
2. Control of dusts and smokes produced in the use of oxygen in steelmaking, especially

   (a) in converters
   (b) in electric-arc furnaces
   (c) in the scarfing of ingots

3. Protection against dust and smoke at steel-melting furnaces, cold-blast or hot-blast cupola furnaces, reheating furnaces, drying furnaces, in heating of ladles, etc.
4. Dust suppression in burden preparation, including crushing and screening or ores and fluxes, and in the sintering of all fine ores and storage and transport of ores, fluxes and sinters
5. Dust suppression for the benefit of moulders, core-makers, strippers, trimmers and cleaners

B. Pure research

Studies on:

1. Co-ordination of dust measurement procedures in the iron and steel industry with a view to the early standardization of

   (a) reference values (*e.g.* dustiness-level measured per ton of steel produced or per cubic metre of gas per second, size and weight of dust particles, etc.)
   (b) measuring instruments and methods

2. Determination of dust production on different steelmaking jobs, with special reference to

   (a) nature of the dusts produced (chemical and mineralogical composition, coarseness, etc.)

(b) amount of dust produced
(c) number of men employed on the job concerned
(d) harmfulness of the different dusts

VI b *Research in preparation under programme on control of air polluents given off in iron and steel production*

A. Applied research

A.1. Nature and extent of air pollution inside and outside the plant
A.2. Development and improvement of processes, installations, appliances, and products for reducing air pollution

A.21. – Means of preventing or restricting the production of dusts, fumes and gases
A.22. – Means of rendering less harmful those dusts, fumes and gases which are bound to be produced in certain operations (*e.g.* by substituting safe or comparatively safe substances for certain definitely dangerous ones now in use)
A.23. – Means of trapping and precipitating dusts, fumes and gases as and where produced or nearby
A.24. – Means of providing individual protection for personnel working in atmospheres with such a high dust, fume or gas content as to involve discomfort or actual danger

B. Pure research

B.1. Improvement and co-ordination of techniques and instruments used in the sampling and analysis of dusts, fumes and gases inside and outside the plant
B.2. Bases of pollution control

B.21. – Principles of the trapping and precipitation of dusts, fumes and gases
B.22. – Principles of individual protection against dusts, fumes and gases
B.23. – Principles of dispersion of air pollution inside and outside the plant