THE USE OF EXPERT MANPOWER IN HEALTH AND SAFETY IN FRANCE

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The Use of Expert Manpower in Health and Safety in France

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SUMMARY

The thesis examines the system of occupational health and safety in France. It analyses the use of expert manpower in the field with a view to establishing the possibility of a profession in health and safety.

An input-output model is developed to bring together the necessary elements of prevention of accidents and occupational diseases. The role of institutions concerned with health and safety is analysed with reference to this model. The research establishes the need for a health and safety specialist role. The recognition and status of this role are found to be subject to other criteria including the acceptance by institutions of such a specialist role. The model is also used to define the role of this specialist as expected by the various institutions intervening in the field.

Occupational health and safety
Expert manpower
Professional role
Input-output model

For Badia and Amina

A C K N O W L E D G E M E N T S

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PREFACE

The following description situates the project within a practical context and explains why it was of interest to the author.

The author took the M.Sc. Safety and Hygiene course at Aston University in the academic year 1977-1978, and was appointed director of the Institute of Exact Sciences and Technology on his return to his home Country (ALGERIA), in September 1978. This institute was then being established in the university of Batna.
Two years later he took the initiative to set up a university based course in safety and hygiene within this institute. The project received wholehearted support from Professor ABROUK and Dr. BELLOUAM then respectively Rector and Vice-Rector of the university of Batna. It also received great help and support from all members of the institute. The project was approved by the Ministry of Higher Education in May 1980, and the department of safety and hygiene was created in September the same year.

Previously the training of health and safety specialists was almost entirely internal to the organisations and characterized by a heavy reliance on field training backed up by short formal courses run mainly by the department of safety and hygiene of Bordeaux University (France), either in the organisations at home or for a few months in the department in France. A few large organisations, such as the National Oil and Petrochemicals Company (SONATRACH), sponsored students for higher degree courses in safety and hygiene in Miami University (USA) and Aston University (UK).

The course at Batna started in the very pragmatic manner just described, and the problem with which the author was faced in designing the course was the content of the syllabus.
Indeed this is the crucial problem with which training institutions have been faced and on which differeing views still exist.

The reasons for this state of affairs are numerous :

- In general there is no job specification which sets out the responsibilities and objectives for the HSS function. In companies where such a document exists it is written in very vague terms reflecting the immediate needs and the type of the organisation. No concrete elements can be drawn out to build a comprehensive syllabus. This has led to the creation of numerous specific short courses by various organisations, internal courses run by the organisation and external courses run by workers organisations and employers organisations catering to these immediate needs.

- Observations and interviews with job holders reveal large differences in the content of the day to day activity. Some of these interviews will be discussed in a later section.

- The nature of the field of occupational health and safety is still not very well defined. The report of DOS SANTOS and ULIANA (1982) indicates that there is a general agreement among the training institutions of the E.E.C. countries that this field is applied in its nature. But there is a large disagreement on what should be the constituent elements of the teaching syllabus. There are those who regard this field as a science in its own right though they admit that it is at its embryonic state. Others consider that it is only a sum of knowledge and techniques drawn from other disciplines such as mathematics, physics and chemistry to solve the problems of occupational health and safety. The existing course differ between countries and between institutions within each country.

The approach that has been adopted and still prevails is a largely multi-disciplinary one. Academics have moved from their respective domains of expertise to the field of occupational health and safety, and each of them has continued to view health and safety with reference

to his own background training. The teaching methods have been left entirely to the competence of the individual lecturers and their understanding of the field of occupational health and safety. This situation has meant that the traditional teaching model is reproduced year after year.

The course in Batna was of necessity based largely on the Aston University B.Sc. course and the Bordeaux I.U.T. course and so it could not escape these drawbacks at the time of its inception. The interest in this current research topic arose from this experience and the broad question which needed answering was :

How could a specific training for HSSs be designed for industrial organisations in Algeria ?

It was evident that such a course must include the National Regulations in the training syllabus and indeed this was done. What was not clear was how to structure the other components of the syllabus taking into consideration political and organisational issues particular to the field of prevention of accidents and occupational diseases in one country.
It was not possible to continue to run a course based on other countries' characteristics; nevertheless it appeared beneficial to study their experience in order to discover the principles which underlie the successful solutions (or the failures) and translate those into the National framework.

The author had some knowledge of the British and French health and safety systems and also spoke English and French. In addition, there was existing collaboration between Batna, Aston and Bordeaux. For these reasons the two countries of study were chosen to be England and France. The project started out as a comparative study of the role and function of the HSS with special reference to training needs. There was no way in which the study and translation could be made directly at the level of syllabi, since as DORVAL (1977) had shown, even in these countries the syllabi were not based on any systematic study of the role and function of the HSS. The fundamental gap was therefore to study these needs.
It soon became evident that the scope and task involved in the study of this question in two different countries and their translation into a

third country was too big to be managed within one Ph.D. thesis, and a choice had to be made to consider one single country.

- In the United Kingdom a specific project on the role of the HSS in Britain had started at the Department of Occupational and Environmental Health and Safety at Aston University (GRAYHAM 1981).

- The Algerian system of prevention of accidents and occupational diseases bears similarities with the French system in terms of organisation of roles and responsibilities of the main bodies involved in this domain and also in the structure and organsiation of the educational system. Also no such research had been done in France so far.

- A study based on the French system combined with the study of GRAYHAM in the United Kingdom would provide the answer to the author's question as it applied to practice in Batna.

The project was therefore limited to the study of the role of the HSS in France, and was carried out at the Laboratory for Research and Systems Analysis for the Improvement of Working Conditions (L.A.R.S.A.C.T.) of the I.U.T. of Bordeaux, under the joint supervision of Dr. J.D. DOS SANTOS (Bordeaux) and Dr. A.R. HALE and Dr. A.I. GLENDON (Aston).

GLOSSARY

A.C.P.	:	Analyse en Composantes Principales = Principal Components Analysis.
A.F.C.	:	Analyse Factorielle des Correspondances = Factor Analysis.
A.F.P.A.	:	Agence de Founation Professionnelle des Adultes = Professional Training Agency for Adults.
A.F.T.I.M.	:	Association Française des Techniciens, Ingenieurs et Medecins du Travail = French Association of Technicians, Engineers and Industrial Physicians.
A.I.F.	:	Association des Industriels de France = Assocation of French Industries.
A.I.T.A.S.A.	:	Assocation des Ingenieurs, Techniciens et Animateurs de Sécurité d'Aquitaine = Association of Engineers, Technicians and Animators of Safety in Aquitaine.
Animator	:	Translation of "Animateur", a title used for the HSS whose main role is coordination.
A.P.A.V.E.	:	Association des Propriataires des Appareils à Vapeur et Electriques = Association of Proprietor of Steam and Electrical Insallations.
A.S.S.E.	:	American Society of Safety Engineers.

C.E.A.	:	Commissariat à l'Energie Atomique = Atomic Energy Authority.
C.F.D.T.	:	Confederation Francaise Democratique du Travail = French Democratic Confederation of Workers.
C.G.C.	:	Confederation Generale des Cadres = General Confederation of Managers.
C.G.T.	:	Confederation General des Travailleurs = General Confederation of Workers.
C.H.S.	:	Comité d'Hygiène et Sécurité = Health and Safety Committee.
C.H.S.C.T.	:	Comité d'Hygiène, de Sécurité et de Conditions de Travail = Committee of Health, Safety and Working Conditions.
C.N.A.M.	:	Conseratoire National des Arts et Metions = National College of Arts and Crafts.
C.N.A.M.	:	Caisse Nationale d'Assurance Maladies = National Social Security Sickness Fund.
C.R.A.M.	:	Caisse Regionale d'Assurance Maladies = Regional Social Security Sickness Fund.
C.N.P.F.	:	Centre National du Patronat Français = French Employers National Centre.
E.E.C.	:	European Economic Community.
F.O.	:	Force Ouvieux = Workers Force (Trade Unions).
H.S.S.	:	Specialiste en Hygiène et Sécurité = Health and Safety Specialist.
I.L.O.	:	International Labour Organisation.

I.N.R.S.	:	Institut National de Recherche et Sécurité = National Safety Research Institute.
I.U.T.	:	Institut Universitaire de Technologie = University Institute of Technology.
Hygiène et Sécurité	:	Safety and Hygiene, the word "Hygiène" covers general aspects of occupational health and therefore the expression is taken to mean Health and Safety.
Medecine du Travail	:	Occupational Medicine
Medecin du Travail	:	Industrial Physician.
Prevention des Accidents et des Maladies Professionelles	:	Prevention of Accidents and Occupational Diseases.
O.P.P.B.T.P.	:	Organisine Professionnel de Prevention du Batiment et des Travaux Publics = Professional Body for Prevention in Construction and Public Works.

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CHAPTER 1

INTRODUCTION

This chapter describes the theoretical context of the study and poses the main question of the thesis. It also provides the structure of the thesis.

1.1. THE INCEPTION OF THE (HSS) FUNCTION

In the early days of the industrial revolution, management believed that a large number of industrial accidents were attributable directly or indirectly to poorly guarded machinery and equipment. A natural reaction was to look to the engineering staff to correct the problem. Usually an engineer was assigend to the task. The result was the creation of the SAFETY ENGINEER (de FREMONT 1984).
A similar situation is reported in other countries (see for example GRAYHAM 1981 for U.K. and POPE and CRESSWELL 1965 for the United States).
The safety engineer was chosen for a profession that he would not necessarily have chosen by himself. Nevertheless he was expected to learn the profession by himself and in a very short time.

There are other factors which contributed to the development of this profession :

- The law establishing Health and Safety Committees (HSC) in FRANCE in 1947 stated : *"The head of the safety department or the agent charged with safety in the organisation, when there is one, shall be the secretary of the committee"*, (Decree of 1st August 1947). Though it did not make the post mandatory, this law has contributed, to a large extent, to the evolution of the HSS function both in the number of HSSs employed and in the content of the job, (SEILLAN 1981). The HSS remained officially the secretary of the committee up to 1982 (HSWCC 1982) and in practice he often still is as will be shown later.

- In 1952, the French Electricity Board (Electricite de France) obliged its building contractors to establish Interworks Health and Safety Panels and a safety policy. These contractors often recruited a person charged with carrying into effect the decisions of the panel and the safety policy. Fifteen years later this initiative became law (Decree 19th August 1977), and covered all construction works. Again the law established the Interworks Panels, but did not prescribe the employment of the HSS. However, in practice many have been employed for this purpose.

1.2. INCREASING NUMBERS IN THE PROFESSION

The National Association of Safety Technicians, Engineers and Industrial Physicians (Association Francaise des Techniciens, Ingenieurs et Medecins du Travail : AFTIM) was formed in 1953, with about 70 members. It now has 1,350 members. Other associations were also created at a local level : e.g. the Association of Safety Engineers, Technicians and Animators of Aquitaine (Association des Ingenieurs, Techniciens et Animateurs de Securite d'Aquitaine : AITASA) was formed in 1977 with 25 members. It now includes 135 members. The aims of both organisations have always been to raise the professional competence of their members by exchanging information and developing methods and technical practices in the prevention of accidents and occupational diseases. These associations have always pressed for recognition of the function of the HSS both at the employers' organisation level and at government level.

Their role in the promotion of the HSS function is therefore not negligible.

1.3. ESTABLISHMENT OF TRAINING COURSES

A key stage in the development of the function and of the profession is the establishment and development of training courses in the field of health and safety, at university level (WILENSKY 1964).

Graduate level courses are now delivered in French Universities. A chair of safety and hygiene was created in 1930 at the National College of Arts and Crafts (Conservatoire National des Arts et Metiers CNAM). It was the pioneering establishment in the field and a course addressed to practicing technicians, engineers and industrial physicians has been running there ever since. However it has always been a part time evening course stretched over five to six years.

A two year full time graduate course started at the Institute of Technology of the University of Bordeaux in 1970 (Institut Universitaire de Technologie - IUT). Four other similar courses are now running in four different IUTs in Lorient, Marseilles and Paris (1975) and more recently in Colmar (1984).
While the CNAM course has always had an intake of students only around 15 to 20 a year and a graudation rate of only 1 to 2, mainly because of the length of the course, the IUT courses have always attracted large numbers of applicants and produced a higher rate of graduates. Table 1.1 shows the evolution of the number of applicants, the number of registered and graduate students from 1970 until today.

The period 1970 to 1975 refers only to the Institute of Bordeaux as it was the only course running for that period. The Institute of Colmar having just started is not included in the table.

Clearly the number of applicants has been increasing each year, whilst the target intake has always been limited to around 250 students in the four departments. This target level is now only 10% of the applicants. The course entry is very selective because the teaching capacities of the institutes are limited. The necessary selection criterion is the Baccalaureat in scientific subjects (equivalent to GCE, A level in the U.K.). Among the registered students so far, the Baccalaureat in Mathematics, Physics, and Biology represents the highest percentage (more than 50%) each year. It seems the most suitable type of Baccalaureat for the breadth and content of the IUT course, a fact which is borne out in practice since the rate of successful graduates with this background is very high. Virtually no one with such a background fails the course.

YEAR	No. of APPLICANTS	No. REGISTERED	No. GRADUATING
1970	30	26	23
1971	250	42	35
1972	220	45	39
1973	190	52	38
1974	200	59	44
1975	565	185	138
1976	838	183	132
1977	951	218	148
1978	1 333	280	178
1979	1 569	274	186
1980	1 961	305	166
1981	2 799	329	116
1982	2 634	246	176
1983	2 732	233	*
1984	2 288	239	*

Table 1.1 Entry and Graduation Rates of IUT Students.

* - figures not available at time of printing.

The course also attracts a considerable number of first year and second year students from other faculties of the University. In the late 1970's the percentage of this type of applicants reached 30%. This may be because the IUT Course is shorter compared with the traditional courses in other faculties but also because the health and safety course offered career opportunities at that time. While there is no systematic scientific evidence to support these conjectures, they are based upon discussions with people involved in HSS training.

1.4. POSSIBILITIES OF EMPLOYMENT

The input demand for the IUT courses is demonstrably high. A key question in linking this to the development of the profession is whether the students who graduate go to work in health and safety. MILLERSON (1964) suggests that only complex employment structures, technologies or organisations are favourable to professionalisation, and ATHERLEY and HALE (1975) suggest that the field of occupational health and safety amply satisfies these criteria. This point will be discussed in detail in a later section of the thesis, and at this stage an indication may be gained from a samll survey questionnaire sent to ex-students of Bordeaux and Lorient.

About 25 to 30% of the graudates are employed by fire brigades every year. The other 70% are employed by various sectors of industry and services. The sample of the survey concerned the latter group and covered 300 students graduated in the period 1979 to 1983. The responses are as shown in Table 1.2.

Place of Employment	Percentage
All Industries	24%
Health and Safety Bodies	17%
Agriculture	17%
Training organisations	7%
Inspection of Labour	2%
Local Government	20%
Other than Health and Safety	13%

Table 1.2 Proportions of place of employment of I.U.T. graduates.

About 13% of the HSSs in the sample were employed in activities other than health and safety. For the 110 who replied to the further question on how long it took to find a job, the responses are shown in Figure 1.1.

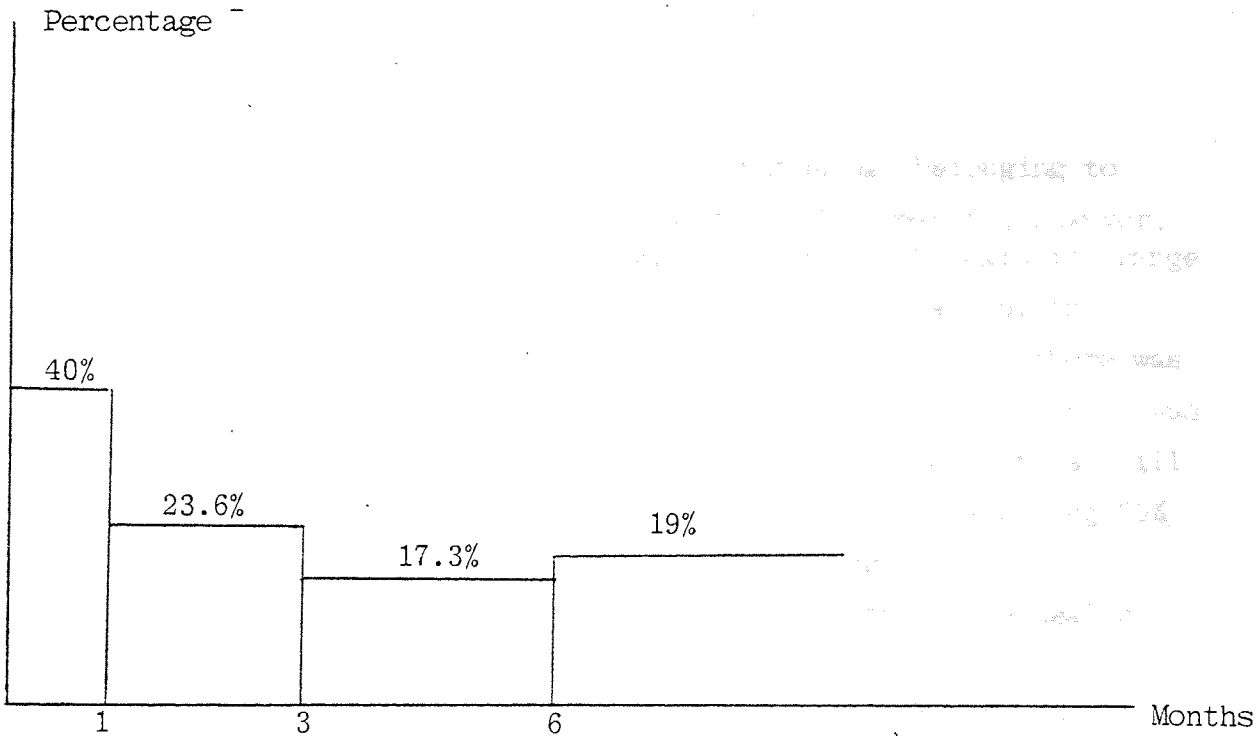

Figure 1.1 Time for search for employment for IUT graduates (1979-1983)

This is a respectable picture, indicating a healthy demand for the graduates. This time is currently longer, but this is not specific to health and safety as it is due to the economic recession and concerns all employment.

1.5. PLACE IN THE MANAGEMENT HIERARCHY

One of the most influential variables on the function of the HSS is his place in the organisation. A first picture of this was formed through consultation of 100 reports of the practical training of final year students of the IUT in various industries over the period 1980 to 1984. Each student had to describe the organisation where the training took place and particularly the type and characteristics of the health and safety department in the organisation, before going on to describe the subject of the particular training project. The choice of the project subject is the main element which determines the place of training, hence students choose various types of industries and services according to their choice of training project. Thus the sample of reports analysed is spread over a wide range of industry. Administrative services such as banking, insurance and business services are not included in the sample but most other activities are. No claims are made that the sample is representive and generalisation must be tempered because of the limited number of undertakings belonging to any specific group of industries in the sample. The results, however, give a rough picture of the situation which indicated the existing range of health and safety organisations in undertakings. In all of the undertakings employing 400 or more, (65% of the total sample) there was some sort of health and safety department. Although sometimes there was just one person and a part time secretary in the department, this still shows in the organisation chart as a department. In the remaining 35% of the undertakings, there was either a part time engineer or a technician or an animator working within the activity of the health and safety committee.

There is no single model of a safety organisation, and in the 65% of the undertakings of the sample which had a health and safety department, there were various locations of the department in the management hierarchy. In 45 of them (70%), the location of the department was as shown in the chart of Figure 1.2, with the safety engineer reporting to the personnel manager.

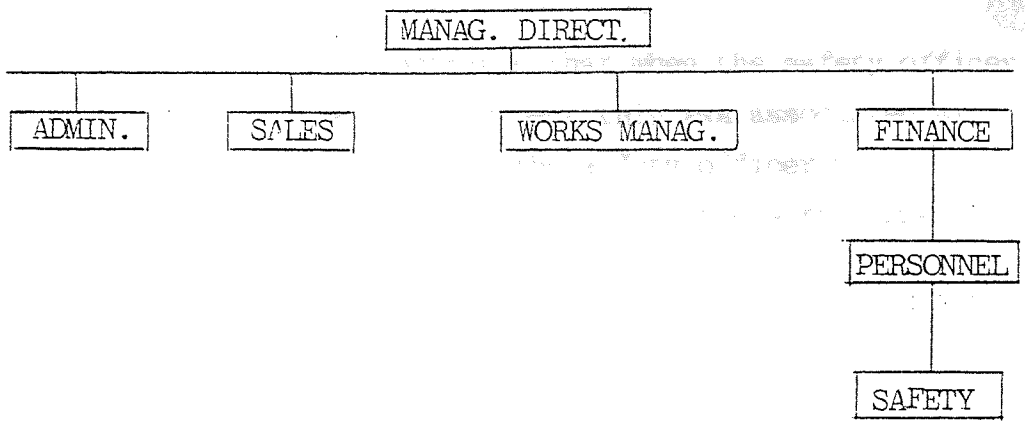

Figure 1.2 Predominant Safety Management Organisation

In 7 cases the safety department was linked as an advisory unit to the managing director, as in Figure 1.3. In the remaining 13 cases the health and safety department was a unit in the Industrial Relations Department.

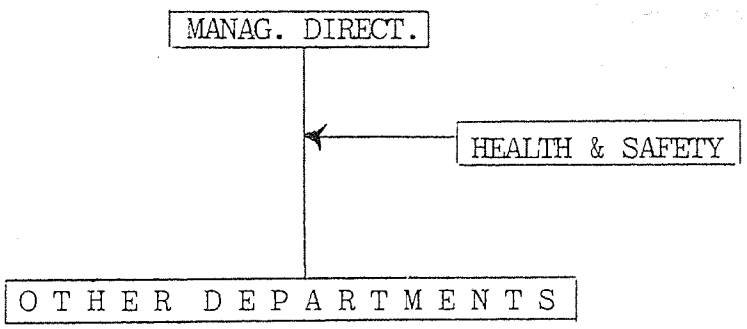

Figure 1.3 Health & Safety Advisory Unit

There is a widely held belief that the health and safety department should be a near the managing director as possible (PETERSEN 1978). These speculations refer generally to an old large scale survey carried out

in the U.S.A. in the 1950s. This indicated that when the safety officer was responsible to higher levels of management this was associated with lower injury rates than was the case when the safety officer was responsible to the personnel manager this was associated with higher injury rates, (ASSE 1951). The generalisability of such a study to the French situation must be treated with considerable caution. In the 35% of the undertakings employing less than 400 and without a specific health and safety department the technician or animateur charged with this job reported to the senior manager.

There was clear evidence in the reports studied that health and safety was a staff function and people charged with it were advisers rather than doers (c.f. HSE 1976).

1.6 VARIABILITY OF JOB TITLES

In addition to the variability of place within management, the job title of the HSS varies considerably. In a sample of 490 members of AFTIM (extracted from membership lists), it was found that 9 job titles are now being used. Table 1.3 shows the number of occurences of each title in the sample.

JOB TITLE	NB. OF OCCRCES
SAFETY ENGINEER	50 %
CHIEF OF H & S DPT	14.9 %
TECHNCIAN	12.8 %
AGENT OF SAFETY	7.7 %
ANIMATEUR	6.7 %
CHARGED WITH SAFETY	3.6 %
RESPONSIBLE	2.6 %
ADVISER	1.2 %
SPECIALIST	0.2 %

Table 1.3 Job Titles

Discussions with job holders and people involved in health and safety in general, revealed that the titles "Animateur", "Person charged with health and safety" and "agent of safety" were used in interchangeable manner and there was no clear distinction between them. From what will follow later the title "Animateur" is the best indicator of the actual role of the job holder. The title "chief of department" was generally used in undertakings where there was a safety department which included 3 to 4 specialised units, and there was generally an animateur or a technician in charge of each unit. In the systems safety unit he was likely to be called a technician and in the working conditions unit, an animateur.

1.7. DISCUSSION

Although the data presented so far are relatively limited, it nevertheless provides some evidence that groving numbers of people are seeking and receiving training in health and safety in France through the I.U.T.s and that the associations of HSSs are also developing and growing. It is evident also that there is no clearly defined job objective, job title or hierarchical position occupied by the HSSs. Their training is still in a formative stage falling short of an integrated discipline despite its fifteen years of existence in universitites.

The AFTIM and all the HSSs Associations have frequently expressed concern about the recognition of the status of the HSS, but their aspirations have never received wholehearted support from any of the powerful institutions (see BOISSELIER 1977).

An indication of the attitudes towards the recognition of the status of the HSS function may be gained from the evidence given by major institutions and bodies in the field of occupational safety and health to a survey carried out by REVUE DE LA SECURITE (1982). The following are brief extracts characterising the attitude of each of them:

- M. Andre NUTTE, delegate of the Minister of Labour in matters related to health and safety, declared that : *"The legislator has no intention to separate work and safety; the safety function should be so integrated into the normal management that there will be no need to speak about it".*

- The delegate of the French Employers National Centre (Centre National du Patronat Francais) also believed in the principle of integrating safety at all levels of management. M. Jean-Marie CAVE said : *"The idea of integral safety, our doctrine since 1966, is very realistic....".* He added : *"The safety function in the undertaking is necessary if only for the complex body of legislation and the abundance of texts and regulations which it contains".*

- The General Confederation of Managers (Confederation Generale des Cadres) accepted the idea of integral safety at all levels of management, but said that this meant integration of safety aspects at all levels in the development of a project, thus ensuring a built in safety. They maintained that the creation of a safety function in the organisation was needed for this purpose, but were not specific as to who should hold this function.

- The Trade Unions were not in favour of the institution of the safety function. Both the French Democratic Work Confederation (CFDT) and the General Confederation of Workers (CGT) expressed the view that the recognition of the safety function in the undertaking was a transfer of responsibility from the employer to the man in charge of safety. One problem with this issue is the confusion, which still prevails, over the meaning of the word responsibility as it can mean duty to carry out a task and a legal duty in terms of jurisdiction. The distinction between the two meanings is not made in the general literature.

The other problem is that the Trade Unions have always regarded health and safety aspects as the workers' domain of involvement and the existence of a HSS is seen as a filter which would negate the influence of the workers' committee (see appropriate study in Chapter 6). They believe that health and safety problems could not be dissociated from general working conditions and should be solved through democratic dialogue.

It was expected that the provisions of the 1976 law would increase the status of the HSS, and at the time of preparation of the new law on health and safety committees (Lois AUROUX), a joint report from eleven associations was addressed to six serving Ministers at that time. The main purpose of the report was to include a provision in the new law which would give official recognition to the safety function in the undertaking and would in turn increase the status of the job holders. M. Jean AUROUX, then Minister of Labour, replied in the following way :

> *"The creation of a specific status for safety engineers may lead to the belief that there are two lines of authority in the hierarchy of the organisation, one line for production and another line for safety..." (Letter of M. AUROUX to the president of the AITASA 28/05/1982.)*

The result was that the law concentrated on the organisation of the committee, on the amalgamation of safety, health and working conditions, and on giving more power to the workers' representatives. It gave a very scant mention of the role of the HSS, specifying that when the HSS existed in the undertaking he could only act as a consultant in the committee meetings, rather than being the official secretary of the committee as in the previous form of the committee.

The problem is further complicated by the existence of a number of rival groups with strong legal, historical and institutional backing which are already occupying the field: the Labour Inspectorate, the Social Security Funds, the Occupational Medicine, and the Health and Safety Committees. Their attitude towards the development and the institution of a function based on health and safety is rather hostile as is shown by this series of brief extracts from the survey reported by REVUE DE LA SECURITE, mentioned above :

- The Labour Inspectors hold the same view as the Ministry which has been discussed earlier.

- The National Security Funds have a very ambivalent attitude to the problem. Its director declared :

> *"It is not our role to define the health and safety function... If the function of health and safety were well performed, there would be no need for our services..."*

This can be read as an admission that the HSS would be a direct (and perhaps more effective) rival of their own staff.

- One of the main consultant bodies in the field of health and safety, the Association of the French Industrialists (Association des Industriels de France) considers that the institution of the health and safety function would be against the fundamental tenets of integral safety.

- The Industrial Physician is very strongly entrenched in the health and safety field, but the body of industrial physicians was not covered by the survey of Revue de la Securite.

- The Health, Safety and Working Conditions Committee is a workers' committee which has an institutional role in the field coupled with massive provision of training and its attitude is expressed by the Trade Unions as discussed previously.

A first reading of texts of legislation which define the roles of these institutions and the claims which the institutions make for their scope give a picture of complementary, and even of a superabundance of specialist manpower in the field.
In reality there is some indication that the simultaneous intervention of all of them in the field spoils their image in the eyes of the recipients of their services (workers and employers), weakens their efficiency and above all encourages professional rivalries which are unnecessary and counterproductive. Indeed the study of LETBOUBLAN (1979) in building and public works revealed that 60% of the employers he interviewed did not know the exact role of each of the actors intervening in the field of occupational accidents and diseases. A more recent study of the Atomic Energy Authority (Commissariat a l'Energie Atomique CEA 1985) revealed that 75% of 4,000 workers responding to the survey knew that the role of the industrial physician was but only 57% declared that they would go to see the industrial physician for problems related to safety. The same study reported that only 39% of the workers knew the role of the various external insitutions intervening in health and safety but only 25% would consult them for problems of safety.
The study of POUBLAN (1980) in 12 undertakings of different industrial sectors revealed that 59% of the workers did not believe in the efficiency of the role of the industrial physician in the prevention of accidents at work.

The situation described so far indicates that a group of would be professionals are suffering from an identity crisis and searching and institutional status. The most powerful institutions which would approve this status hold to the concepts of integral safety, the right of management to manage, and consider that an increase in status would only come about if the employers percieve the need for specialist assistance and recognise the importance of a statutory safety function.

In considering the perception of the employer of the need for specialist advice and assistance two indications have been outlines :

- If the rate of employment of graduate I.U.T. students is of any significance the situation is rather encouraging, as discussed earlier.

- The confused picture that the employers see of the role of the various actors intervening for the same purpose, begs the question of who does what, and indeed who can and should do what.

There is evidence that health and safety specialists are becoming more common, and are finding employment, and so, à priori, they are needed. If one is to design a training course for such a group one must have a clear view of how they fit into the health and safety field, and how their role fits with that of others. Above all those who are likely to employ them need a clear view of that role.

1.8 DERIVING OBJECTIVES FOR THE THESIS

The following points arise from this review of the HSS function. These have been important in shaping the prime objectives for the study.

1. Within the domain of health and safety there are various pressure groups, each of whom is pressurising for supremacy. Many of these are well established, although they may have little genuine concern for health and safety 'per se'.

2. The current situation is that the groups which are well established for historical reasons, often supported by legislation, may not necessarily be the most effective in preventing occupational accidents and diseases.

3. The HSS are the least powerful amongst these competing forces. This is because, unlike the older, well established groups, the HSS are the most recent (1951) and still have not received legal recognition. Unfortunately, the older groups, because of their legal support and priviledged position (within the French culture) have formed a virtually impenetrable amorphous mass.

4. However, the current pre-eminent groups cannot back-up their clain for supremacy through other than historical reasons. Worse, their intergroup conflict is proving detrimental in advancing health and safety. In many cases, a further unfortunate consequence of this conflict is a deterioration in the overall contribution they could and should make towards improving in-plant health and safety.

5. Reference to points 1-4 indicates how the contribution the HSS could make is being nullified. However, owing to various factors identified in the thesis, the HSS themselves probably have not fully appreciated their potential value in this arena.

6. The manner in which this problem could be resolved would prove difficult. The most effective way could be through illustrating the fallacy of the current pre-eminent groups' claims of supremacy by demonstrating their relatively ineffective contribution towards improving all aspects of health and safety within undertakings. This may effectively influence and motivate professional, public and political opinion - a process which can be most effective in a democracy. Ultimately the consequences could be a lessening of tension and conflict, improved co-operating and, in turn, maximise the contribution of all groups concerned with health and safety.

The prime objectives of the thesis are therefore:

i) to describe the position of HSS and other relevant groups in France,

ii) to explain the conflicts which arise between groups,

iii) to validate the usefulness of the systems approach for the study of organizations.

1.9. STRUCTURE OF THE THESIS

In the introduction to this study the objectives have been identified (c.f. 1.8). The following chapter discusses the model of analysis. The remainder of the thesis is in two parts.

The systems or input-output model described in Chapter 2 is the main tool of analysis. The theoretical model takes a perspective which conveniently integrates all activities within health and safety. It is logical in concept and approach; progressing from consideration of the nature of danger through the methods for its elimination or control.

The two phases of analysis which together form the remainder of the thesis are conducted at the 'macro' and 'micro' levels. In general these terms are used in a similar fashion to that in economics. However, strictly relating the term macro to this study means; *'A study of the four principal groups (Labour Inspectorate, Occupational Medicine, Social Security Funds and Health and Safety Committees) involved in in-plant health and safety".*

The study looks at the way the legislation assigned the groups their respective domains of activity, their objectives, the interpretation of these objectives and the actual activity in the undertaking.

The term micro means; *"An introspective evaluation and assessment by the four groups of their activities within the undertaking. However, it includes their consideration of the role of the HSS in health and safety".*

It is acknowledged that a similar process could have been conducted by assessing the needs of the undertaking and then investigating if or how the four groups satisfied that need. This procedure would have shown the interaction between the various groups within the undertaking. This method was not adopted for two main reasons. Firstly, there is a propensity for respondents to provide 'socially acceptable answers' to surveys. Consequently the inferences drawn may have been biased (OPPENHEIM 1976). Secondly, it was considered that this method would not have achieved the evidence required to motivate any change found to be necessary.

Evidence for this inadequacy can be found by reference to studies conducted by the IRNS (1977, 1979). This official body investigated and identified health and safety needs within the undertaking. However, the IRNS largely overlooked the contribution of experts. The inevitable consequence was a complete lack of appreciation of the contribution of one of the most useful groups in health and safety, the HSS. In contrast, the contribution of the legislatively recognised groups was implicitly recognised by the IRNS through being taken as a given.

This study intended to avoid the trap identified above, that is, taking the contribution of all experts as given - while actually failing to identify the contribution of the potentially valuable and hitherto underrated body, the HSS. Accordingly, the approach adopted was to investigate health and safety from the perspective of those bodies actively most concerned, irrespective of their official or legally defined responsibilities.

This meant that all the bodies directly concerned with health and safety within the undertaking were consulted, including the HSS, to identify what they considered were the needs of the undertaking. Thus, earlier studies had assessed needs introspectively (ie. by investigating the undertaking and then through 'non-expert' evaluation and ofter predetermined standards of measurement, to establish the health and safety needs of the undertaking). In this study the needs were identified by those most involved and knowledgeable, ie. the health and safety professionals or experts.

Using this method offers the further advantage of certain areas of self-deficiency being identified by the legally recognised bodies. This deficiency may then be filled through greater participation in health and safety by the HSS. The HSS proved to be the only body which could combine all the necessary, even essential expertise in health and safety, together with an understanding of each undertaking. It is possible, that as a central focus, the contribution of a suitably trained and qualified HSS may prove vital. None of the existing legally recognised specialists, or, in contrast, relatively low-level bodies (the HSWCC) could fulfil a similar role. In addition, since the various established bodies provided recognition of the deficiencies in the existing system, their co-operation would be more likely.

This raises the question of professionalism. However, professionalism can have two facets, the actual and the emerging (ATHERLEY and HALE, 1975). Health and safety demands a multi-disciplinary and multi-profession approach - unless one body has sufficient knowledge and understanding of all aspects of health and safety and can thereby co-ordinate activity. The existing, legally recognised bodies, with the exception of the HSWCC, are composed of members of the established and formally recognised professions, eg. medical. The exception, the HSWCC, although comprising low status employees, has formal legal recognition. The HSS does not have legal recognition, but in the field of health and safety clearly can be seen as an emerging profession and is treated as such throughout this study.

CHAPTER 2

THE MODEL OF ANALYSIS

The clarification of the roles of the institutions involved in occupational safety and health must start with a clarification of the concepts of safety and health. This leads to the fundamental question of : "HOW DO ACCIDENTS AND OCCUPATIONAL DISEASES HAPPEN ?". The answer to this question remains a challenge to researchers, practitioners and indeed all parties concerned with the subject.
Most of the theories of accident causation are based on two distinct models ; behavioural or situational (AYOUB 1975). The behavioural models are based on the postulate that man's psychological and physiological characteristics are the elements that control the accident process. The situational models attempt to examine the interactions between man, machine and environment. Such models are derived from epidemiological approaches like the studies of FAVERGE (1967) and SURRY (1969). These studies consider an accident situation as a system of three interacting components man, machine and environment. If any of them is modified then the accident probabilities may be altered.
Recognising the existence of numerous variables interacting in various ways in any accident situation has been a step forward in health and safety research (see LEPLAT and CUNY 1974). However the efforts must also be directed towards understanding the nature of the interactions and the quantification of the relationships.

A systems approach is a useful way of bringing the interactions under the same framework, even though it will sometimes be limited to the description of the interactions.

2.1. THE SYSTEMS CONCEPT

Classical general systems theory is based on the simple concept of a system and a corresponding environment. A system is generally defined as a set of interrelated elements. Strictly speaking, the environment of a system is defined as everything which is not part of the system, (ACKOFF 1971).

For systems in an environment which is finite and differentiated, a more convenient systemic paradigm has been proposed, namely the environment of a system may, for operational purposes, have systemic properties of its own, (EMERY 1969). The essential feature of this concept is that the output of one system is an input to the other system. Furthermore the concept of finite environment may be extended to three, or indeed any number of systems. Even the most complicated networks of interrelated systems can be reduced ultimately to a set of binary relationships between selected pairs of systems. This concept provides an interesting framework for socio-technical systems and a good criterion of functional efficiency as a measure of systems performance.

2.1.1 THE ORGANISATION

Several authors define the organisation as a coordinated and purposeful system operating in both social and economic environments (see e.g. CARTWRIGHT et al 1975, and MERIGOT et al 1980). The main inputs and output elements of this system are summarized in figure 2.1.

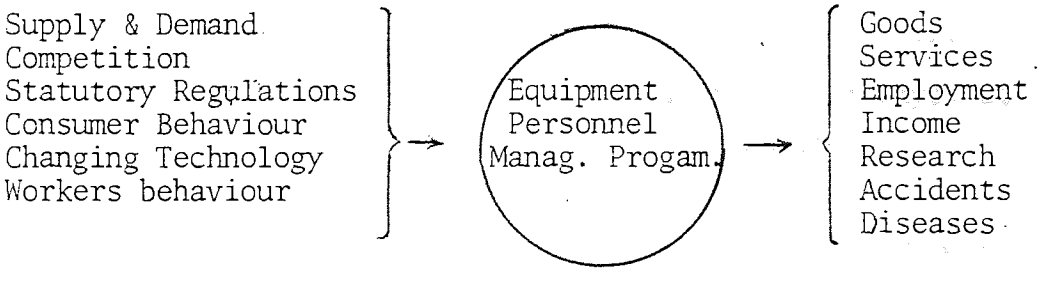

Figure 2.1 The organisation and its operational environments.

Organisations are generally structured in a functional manner and the health and safety set up is a department or a unit within this structure, as was discussed in Chapter 1. This thesis is an examination of the tasks and functions assigned to various individuals and bodies to be carried out in all kinds of organisations. The model for analysis must therefore be a general one, independent of organisational structure.

The proposed input-output model in figure 2.2 is flexible and will encompass all types of structures of organisations. This type of model has already been used by ATHERLEY (1978) in describing occupational diseases in relation to the body, by HALE and PERUSSE (1978) in relation to individual perception of danger, and also by COLLINS et al (1979) in the study of organisations and their methods of working.

For the purpose of the model DANGER is defined as a threatening phenomenon characterised by an equipment and/or organisational and/or a human failure. Although it arises from work within the organisation as well as imported to it, it will be considered as an input to the organisation. It will go through a dynamic sequence, as indicated by the elements of the model, until it is eliminated or retained under control or until it causes a human injury and/or a damage. The direction of flow of danger is indicated by the arrows.

2.1.2 THE ELEMENTS OF THE MODEL

A - TYPES OF DANGER

Refering to the situational models mentioned earlier, the three components which may give rise to danger individually or by interaction in pairs or altogether may be stated as follows : Physical conditions, Organisational conditions, and Human conditions.

A-1. Physical conditions : These can be classified under two main categories: Energies and Chemical substances. The energies include all types : mechanical, electrical, thermal, radiant and ionizing radiation. The chemical substances include the whole range of substances and compounds embraced by organic and inorganic chemistry.

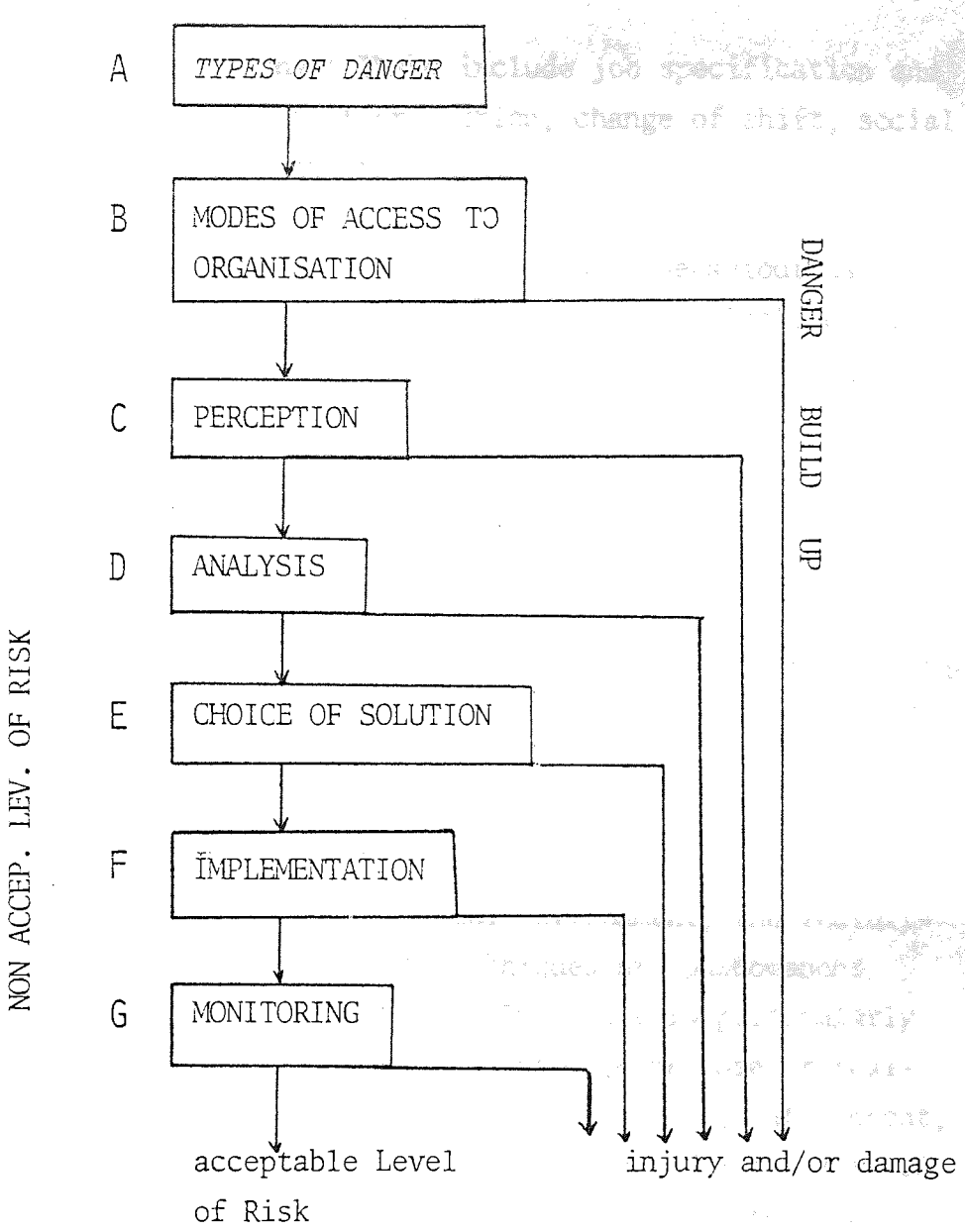

Figure 2.2 THE INPUT-OUTPUT MODEL

A & B Breadth of job

C to G Problem Solution Sequence : Level of intervention

A-2. Organisational conditions : These include job specification and description, work layout, rate of production, change of shift, social climate within the organisation etc.

A-3. Human conditions : These include the person's behaviour as a function of his physiological and psychological state. Included also are his ability to perform the job correctly and perceive and avoid danger when necessary.

B - MODE OF ACCESS

This describes the ways in which danger may gain access to the organisation. As stated above this is taken to include the many dangers that are generated within the organisation, i.e the modes of failure of the equipment, and/or the organisation and/or the human. Three modes of access are identified for the purpose of the model.

B-1. INNOVATION : The introduction of new technology, new equipment, new materials, new processes, new physical environment, the recruitment of new personnel, new management techniques are phenomenons which may bring about new dangers. The failure rate is particularly high when any of these items is first put into use because of residing defects or vulnerability when being run in. Although at present, the reliability of equipment and machinery has considerably improved, human reliability remains a challenge to designers, engineers and psychologists especially at the interface between man and machine, or indeed the physical environment. The work of SWAIN et al (1983) on Nuclear Power Plants is an example of one response to this challenge.

The recruitment of new personnel or the introduction of new conditions of work necessitates a period of adaptation during which the worker fits himself to the new working conditions, and his failure rate is very high during this period (see SALENGROS 1967, for example).

B-2. WEAROUT : This is due to deterioration as a result of ageing, or prolonged use of equipment and machinery. Human beings are also subject to physical wearout through age or fatigue or through habits acquired gradually, relaxation of care, overfamiliarity and gradual

deterioration of working relations with workmates, foremen etc...

B-3 MAN-MACHINE-ENVIRONMENT INTERFACE : The two preceding modes are concerned with the failure of the equipment, or the human individually. This mode refers to points of interaction between man and machine, man and environment. In the first category are included displays, controls and levers, indeed any item that a person observes or uses in his work station in order to perform his task. In the second category are included items like job description, written procedures, safety rules, relationships with work mates, foremen and higher level management. It may also include person to person communication, interaction between departments and between working teams. This mode of failure is quoted in numerous accidents and disasters (see LEPLAT et al 1979 and SWAIN 1983).

C - PERCEPTION OF DANGER

Some dangers are obvious and can be easily detected, the majority are not. The crucial phase in the sequence of the model is the perception of danger. The perception of danger can take place at three stages : the existence of danger, the danger buildup, and the danger release.

A number of techniques are now available for use in attempting to perceive the existence of danger. Failure Mode Analysis, Fault Tree Analysis, Hazard and Operability Studies, are examples of these techniques.

Some of them are inductive (e.g. F.M.E.A.) others are deductive (e.g. F.T.A.). All of them are mainly concerned with failure of the hardware.

Dangers not perceived at the design stage will remain in existence and start to build up, (MARKHAM Colliery Accident 1973). Critical Incident Technique, Inspection, and Accident Investigation are the main perception methods at this stage.

Danger release is the final stage of the buildup immediately before injury and/or damage. At this stage only people involved with the equipment or process and in its immediate vicinity are likely to perceive the danger unless there is a warning and it is known and

perceived.

The perception of danger buildup and danger release has been the subject of study in relation to the accident process for a long time. Several attempts have been made to model the process (HALE and HALE 1970, SURREY 1969, and HALE and PERUSSE 1978) and as HALE and PERUSSE point out none of the models satisfactorily identifies all the stages involved. They consider their model as the most up to date one (see figure 2.3. It is incoporated here to show the complexity of the perception process.

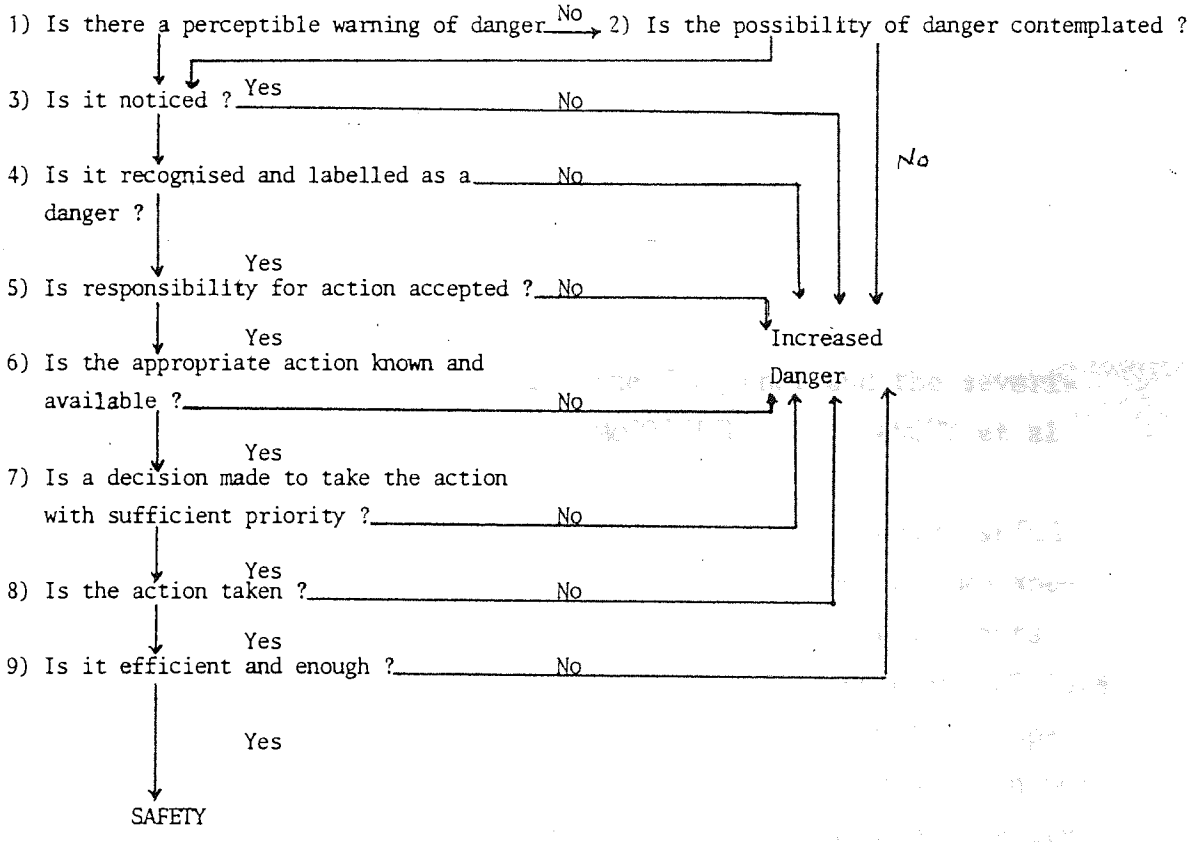

Figure 2.3 A decision model of the accident process (Hale & Perusse 1978)

Again the models are concerned with the man-machine interface and do not integrate all the modes of failure in the sense of the definitions proposed earlier. Human failures for example are only studied in relation to the perception of danger and not as possible causes of danger. This is because danger is considered as a potential energy or other source waiting to be released. Actions do not create danger per se, they bring it closer or take it further away.

When danger is perceived it must be subjected to the appropriate level of analysis. It is therefore important that perception is by individuals, groups or institutions who are capable of this or will inform those who are capable.

D - ANALYSIS OF DANGER

This stage covers techniques to *ascertain* the nature of danger, its cause, development and mode of access to the organisation. An evaluation is made of its potential for harm and/or destruction and the probability of occurence. At this stage is introduced the concept of risk which is expressed in terms of the expected damage and the expected frequency of occurence. The basic definition is the product of (Frequency F) x (Severity of Damage D). However it should be noted that there are other possible definitions, for example ;

$$\text{Risk} = F \times D^k \quad \text{where } k \neq 1.$$

This tends to amplify the importance of events with large damages. Other interpretations of risk involve the frequency and the severity of damage in nonproduct form (see McCORMICK 1981, TANGUY et al 1978, and KLETZ 1978).

The deductivenature of the methods like F.T.A. is extremely useful in this analysis. Unfortunately they have been limited to some specialised industries mainly the aerospace and nuclear power plants. They are just being introduced in other industries (see GUYONNET 1978 and 1984). Useful as they are, many companies still view these approaches with pessimism as indicated by AYOUB (1975) and also in our survey on the state of the art of the role of the health and safety specialist (see previous chapter).

E - CHOICE OF CONTROL STRATEGY

Following the recognition of danger, and the analysis phases, dangers should be controlled if not eliminated. This involves the determination of the degree of danger which can be tolerated. This is based on the criteria of acceptability of risk, which in turn is a function of several variables (time, context, financial resources, available technical competence, etc...). A detailed discussion of each of these

parameters separately may be found in the books of ATHERLEY (1978) McCORMICK (1981), FISCHOFF et all (1981) and Royal Society (1983). It would be beyond the scope of this work to pursue this concept.

There is a clear evidence that there is no scientific formula upon which to base the decisions. This makes the role of the decision makers difficult. Although new methodologies for translating moral arguments into the langage of management are now being introduced, GROSE (1980).

ATHERLEY (1975) subdivided the control strategies into preaccident strategies, post-accident strategies, and collateral strategies. This classification is useful in this model as it will enable a corresponding classification of the intervention of the institutions which will be analysed.

E.1. *Pre-accident Strategies* are concerned with the prevention of accidents and occupational diseases and may be subdivided into two groups : Safe Place and Safe Person strategies.
E.11. *Safe Place strategies* aim at eradicating danger by seeking safe premises, safe plant, safe processes, safe equipment, safe material, safe systems of work, safe access to work, adequate supervision, and competent and trained people.
E.1.2. *Safe person strategies* aim at protecting certain people from danger by care of the vulnerable (pregnant women, the disabled and young persons), personal hygiene, personal protection equipment, careful actions and caution towards danger.

E.2. *Post-accident strategies* are concerned with actions taken once the accident has happened. There are three subclasses :
E.2.1. *Contingency strategies* which plan for the aftermath of accidents.
E.2.2. *Ameliorative strategies* which aim at minimising immediate injury or damage after the accident.
E.2.3. *Feedback strategies* which are the accumulation of information and its use in the future for preventing or coping with accidents.

E.3. *Collateral strategies* are those where the principal objectives

are only remotely concerned with preventing or coping with accidents. Compensation and medical care, are examples of collateral strategies.

Whatever strategy is adopted there must be a specification of adequate organisational systems to make the strategy work.

F - IMPLEMENTATION

This is the provision of technical hardware and expertise and financial resources to pay for it. Implementation is also management commitment and appropriate workers involment. However this in turn requires competence and time which also cost money.

From a theoretical point of view, the organisation should strive to maintain the highest level of safety performance which current technical "know-how" can sustain. However,having decided on the acceptable level of risk, a level which should comply with the letter and the spirit of the statutory standards when these exist, it seems reasonable for the organisation to operate at optimum levels of performance.
Modeling provides a promising approach for dealing with these issues in safety. The application of operations research and systems theory are being introduced to this end (AYOUB 1981).

G - MONITORING

Appropriate measurements have to be made either quantitatively or at least qualitatively to compare the results achieved with the objectives and standards agreed on, at the choice of strategy phase. The techniques available are the same as those mentioned in phase (C). Indeed monitoring is the perception of any signs of residual danger.

If the objectives are not achieved, the process goes back to the analysis phase and the solving process runs again.

2.2 INTERVENTIONS

Generally speaking all types of dangers whatever their modes are prevented by engineering skills, personnel training, work procedures,

and good selection of personnel for corresponding work stations, etc...

In addition the majority of organisations have maintenance and inspection departments which carry out operations to ensure the reliability and availability of the system of work in terms of periodic inspections and repair of the equipment and machinery for example. Their interventions contribute also to the prevention of accidents and occupational diseases, e.g. non destructive testing carried out on pressure vessels will detect cracks in the vessel, and their repair will prevent the release of toxic gaz, explosion or whatever danger is linked with.

As BOOTH (1979) demonstrates few accidents are attributable to causes which are beyond the conventional engineering skills. The main causes are attributable to lack of understanding of the forseeable behaviour of people in terms of human error and risk taking and also to organisational shortcomings in terms of procedures to identify and control dangers and the break down of these procedures in the face of pressures for production. The author supports his arguments with a study of five major accidents in the United Kingdom : The Tay Bridge Disaster 1879, the Cammel-Laird Boiler Explosion 1929, the Brent Cross Crane Crash 1965,the Brake Failure at Markham colliery 1973, and the Flixborough Disaster 1974. Similar shortcomings have been the causes of other major accidents such as the Seveso Accident 1976, and Three Mile Island 1979 (see LAGADEC 1981).

This demonstrates the need for intervention in terms of advice and monitoring in safety within the organisation. At present in FRANCE there are four institutions which have statutory provisions to intervene in matters related to occupational health and safety in the organisation. The following chapters will analyse the contribution of each of them to in-plant safety. They will be considered in a chronological order as follows :

- Labour inspection and the role of the inspector of labour.
- The social security funds and the role of the prevention engineer or technician.
- Occupational medicine and the role of the industrial physician.

- Health and safety committees.

2.3. THE METHOD OF ANALYSIS

Each chapter begins with a brief historical perspective which gives an understanding of the development of the job of each actor. It will be shown that the job has changed as the field of occupational health and safety developed, and as will be indicated it will continue to change. The difficulty with this stage of analysis has been to draw the bounds of the scope of the study in order to keep it manageable. To achieve this the tone is kept descriptive rather than analytical.

In the second stage the statutory provisions establishing each institution are considered in order to define what can be called "the theoretical job". The provisions are identified and classified according to the dimensions provided by the model. These are the breadth : the types and modes of access of danger, phases (A) and (B), and the depth of intervention in the problem solution sequence, phases (C) to (G). A section in the Decree, in the Act, or in the Memoranda reading like this : ".... proceeds to the study of all the problems related to prevention..." would be classified as having to deal with all the sequences of the model and therefore will show under phases (A) to (G). Whereas sections dealing with accident investigation and/or inspection would be related to the perception phase (C). A section dealing with a financial contribution in terms of loans from the social security funds would be classified in the implementation sequence (F).
These interpretations are confirmed by the interpretations made by the job hoders (inspector of labour, industrial physician, etc...) of the statutory provisions in what they have written about their jobs and what is written about them in literature in general.

2.4 THE ASSESSMENT OF THE JOB

Having established the extent and depth of involvment of each of the actors in in-plant safety and health as specified by the statu-

tory regulations, the effectiveness of their contributions is examined. The lack of an objective and meaningful criteria on which to base the measurement makes the task difficult. The existing criteria are confused by the variety of interests which support their intentions. Indeed, the acquisition of accident data by the social security funds is directed towards settling claims. The inspection of labour is concerned with collecting information that relates to their mandated safety responsibilities. The employer is interested in finding how the accident happened so that he can stem recurrences. Although many companies still use the frequency rates and the severity rates both of which are derived from the definitions of the social security (an injury serious enough to involve more than 24 hours lost time, or some permanent disablement or death), these criteria may be criticised on numerous grounds : underreporting due to internal policy of the organisation, non applicability to small size firms and above all they do not take into account any other losses.

Even if such criteria were to be use, there still remains a major problem : to whose contribution would a reduction of the frequency rate, for example, be attributable ?

To date no work has been done on estimating the effectiveness of occupational health and safety institutions in in-plant safety in France. Indeed there is a lack of literature in general, leaving aside the fact that the establishment and organisation of these institutions is different from one country to another (see e. g. CHAABANE 1984 for occupational medicine in FRANCE, UNITED KINGDOM and ALGERIA). It would therefore be difficult to rely on foreign literature.

Indeed only few publications could be found in the United States Department of Labour Literature, all of them related to the effect of OSHA inspections :
OI (1975) examined the question of whether inspections are being conducted in places where they might be expected to do the most good. The inspection frequency in five high hazard industries and

five low hazard industries was computed and the results indicated that the low hazard industries were inspected proportionately more. SMITH (1975) compared target and non-target industries, the target industries being the ones which were more heavily inspected. He assumed that injury rates in the heavily inspected industries would be lower than in non-target industries, but did not arrive at a firm conclusion. The same author carried out one further study (1979) involving a comparison of injury rates of plants inspected "early" in agiven year with those inspected "late" in the year, after controlling for prior injury rates. The results suggested that OSHA inspections in 1973 reduced injury rates by about 16 percent, but that 1974 inspections had no statistically significant impact. DIPIETRO (1976) hypothesised that current injury rates are positively related to lagged injury rates and that current injury rates are negatively related to past inspections. The author concluded that the hypotesis had not been satisfactorily confirmed.

The basic assumption maintained throughout these studies is that inspections have auniform impact across all industries. If this is so then the findings of these studies imply that inspections have not been allocated in the most effective way. The implications go even beyond in the sense that both defenders and critics of the Occupational Safety and Health Act of 1970 apparently agree that OSHA has had no measurable impact on injuries and illnesses in the work place (see SMITH 1979). The author supports his argument by the National Statistics of frequency and severity rates. On this basis the same criticism may be addressed to the French Act of 6th. Dec. 1976. Indeed, a look at Figure 2.4 confirms this view, for the national statistics in building and public works industry for example.

The problem of evaluation is thus two fold :

- *Output measures of organisations safety performance are poor and probably not sensitive enough to reflect inputs from external bodies.*

- *Any external body (or internal section of an organisation such as a safety committee) is only one of a number of relevant inputs which may affect the organisation safety output.*

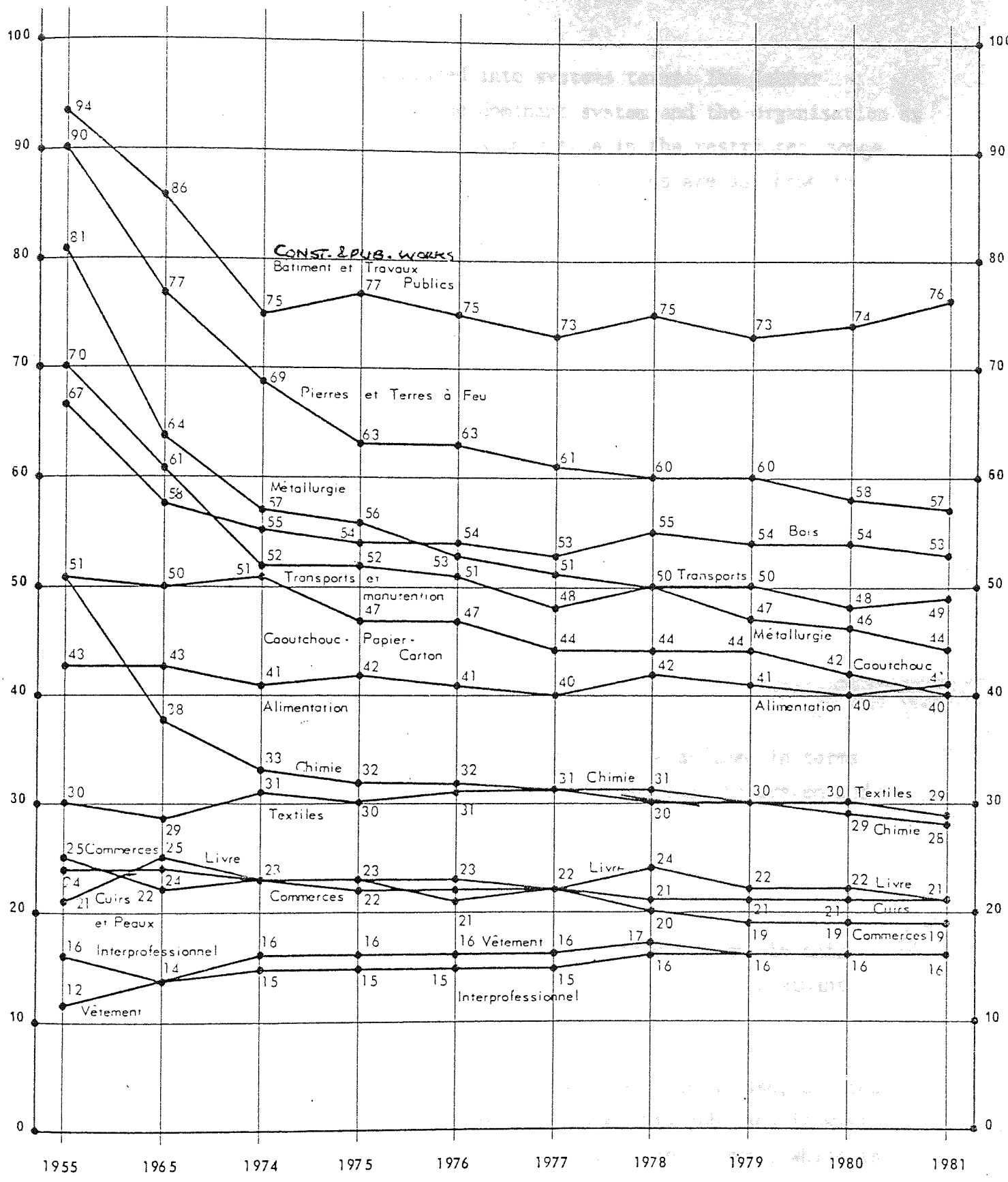

Figure 2.4 VARIATION OF ACCIDENT FREQUENCY RATES FROM 1974 TO 1981

$$AFR = \frac{\text{No. of Accidents with lost time}}{\text{No. of hrs. worked}} \times 1\ 000\ 000$$

(Extracted from CNAM report 1981)

These concerns can be translated into systems terms. The labour inspectorate may be taken as the dominant system and the organisation as its subordinate. Obviously this is only true in the restricted sense of occupational healthand safety. The interactions are as shown in Figure 2.5.

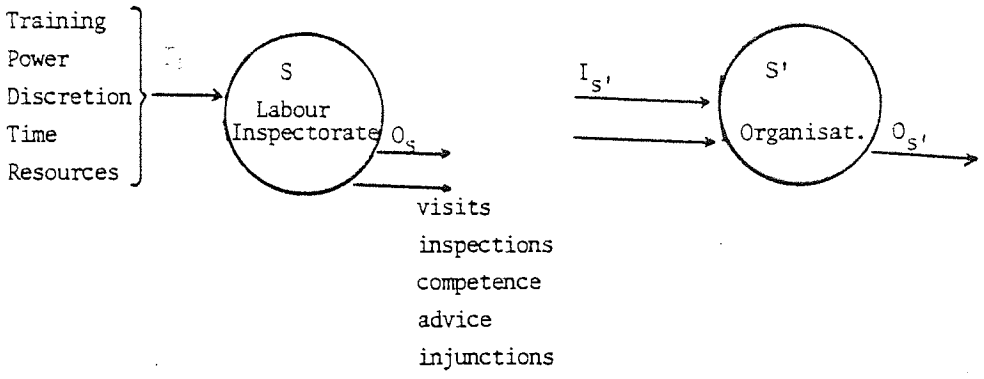

Figure 2.5 - Two systems : (S dominant, S' subordinate)

The performance of a dominant binary system can be defined in terms of the relationship between the output of the subordinate system and the input to the dominant system :

$$\text{Perf.} = \frac{O_{S'}}{I_S}$$

where "$O_{S'}$" indicates the output of the subordinate system, in this case the organisation and "I_S" indicates the input to the dominant system, in this case the inspectorate of labour.

The input to the inspectorate of labour will be in this case, all the resources allocated to an inspector to carryout his job. And it will be expressed in terms of training received and time allowed, which is a function of the manpower of the inspectorate.
The output of the organisation in this case is its safety performance. This is linked with the safety criteria which have been discussed earlier.

Although it is easy to assess the training and manpower of the inspectorate, it will be difficult to relate it to safety criteria and therefore the performance cannot be evaluated in this way.

The concept of binary systems raises another significant feature ; in the limit the output of a dominant system is the input to the subordinate system, that is :

$$O_S = I_{S'}$$

In the limit, therefore, optimum performance will occur when the following expression is maximized :

$$\frac{O_S}{I_S} \times \frac{O_{S'}}{I_{S'}}$$

that is, where the efficiency of each individual system is maximized. The performance cannot be evaluated this way either because the first ratio is only meaningful with respect to its effect on the in-plant safety. The second ratio will express the effectiveness of the statutory regulations and inspections. The evaluation of this ratio has been discussed in relation to OSHA effects in a previous paragraph. This concept is also based on the assumption that the only input to the organisation is from the inspectorate of labour. This is obviously not the case as we have identified, four institutions are intervening in in-plant safety and health.

In this case $O_{S'}$ is the output we are interested in, but this is hard to measure. The term $I_{S'}$ is made up of contributions from other systems, i.e. $\sum_{i=1}^{i=n}$ Osi in addition to its own contribution. However it is not possible to measure the contribution of each O_S on $O_{S'}$, because we do not know the combination rules and $O_{S'}$ cannot be measured well enough anyway.

It is reasonable to say that the effectiveness of each O_S will be a function of how well they fit the needs of $I_{S'}$. This in turn will be limited by each I_S.

Thus we can say that the effect of an individual, a body or an institution on $O_{S'}$ will be limited by the extent to which the resources

at its disposal, and the tasks which it carries out fulfil the requirements of being relevant contributions to $I_{s'}$ which can affect $O_{s'}$.

The relevant contributions have been defined by the Input-Output model. The analysis will therefore determine how far I_s for each body fulfils the stages of the model.

The output of the institutions is expressed in terms of the activity of people acting on their behalf, the inspector of labour, the industrial physician, the security funds engineer and the members of the health and safety committee. Their inputs are the training they have received, the discretion they are allowed as specified in the statutory provisions and also as practised in the organisation.

The activities of each of these actors are reviewed, analysed and related to the phases of the input output model. In this way the phases which are not covered in their activities are identified. Thus making the need for intervention.

The methods of data collection for this part of the demonstration involve : the study of annual activity reports over the last twelve years, visits to the institutions, and structured and unstructured interviews. The methods of analysis are descriptive and sampling statistics. Further details on these methods will be given in the appropriate sections.

CHAPTER 3

THE LABOUR INSPECTORATE

The government intervention affecting occupational health and safety in France, has a long history. The events surrounding its early developments and the establishment of the current legislation are rarely well documented. A brief review is provided as an Appendix in the thesis.
Emerging from the legislation is the labour inspectorate. The inspector was established purely to carry out inspections and monitoring functions, but he has evolved into an engineer and a consultant to satisfy the input needs of the organisations in matters of occupational health and safety.

The objective of this chapter is to examine the extent to which these needs are satisfied. It will review the evolution of the function through the objectives defined by the statute and the interpretation of them made by the inspector. This will be compared to the elements of the input-output model, in order to determine the breadth and depth of the job assigned by the statutes. It will then analyse the efficiency of the inspector through his training, discretion, time and his day to day activities in the organisations. The data are drawn from relevant statutes, annual activity reports, and interviews with a small sample of serving inspectors. The activities analysis will be confined to the period starting from 1971, as access to original documents prior to this date was very difficult, but the data which will be presented is enough to satisfy the objective of this study.

3.1. THE PRINCIPLES OF LABOUR INSPECTION

The law of 22 March 1841 marks the beginning of government intervention.

Although it was mainly concerned with child labour (see Appendix I), it set out the early principles of labour inspection in the following way :

> *"The government will carryout inspections in order to monitor and make sure that the present law is implemented".*

This statement is very broad and does not give any specification as to the type and form of inspection. This indicates the somewhat reluctant attitude of the legislators to introduce government intervention into the system of the economy at that time (see FOUCHER 1978, TOURNERIE 1971, and COURTIER 1975).

FOUCHER reports that the form of inspection adopted was the designation of local inspection committees in each district ; the members of the committees were prominent people from industry, retired civil servants, school teachers etc...

Further in his description the author quotes a government report of 1847 in which it was stated that the law cannot be enforced because there are no such powerful, independent and respected inspectors as there are in England.

It is interesting to note that according to this quotation, the institution of the English Factory Inspectorate was well known in France, to the extent that it is quoted as a model. Indeed the first law on child labour in Britain goes back to 1802 and the Factory Inspectorate was established by The Mills and Factories Act of 1833, (see HALE 1978).

The move toward regulation in some Western Countries seems to have followed the British pattern as reported by GRIMALDI et al (1975) for the United States and by FOURNIER et al (1976) for France. Some similarities and differences in regulation in these three countries are mentioned in the background study presented in Appendix I ; a full comparative analysis being beyond the scope of this work.

The Parliamentary proceeding of 1847 did not have immediate effect because of the events of 1848 in France ; and it was not until the law of 1874 (19th. May) that major changes were introduced in the regulation of child labour. The system of Inspection Committees was abandoned and fifteen inspectors were appointed the same year. The law provided also for designation of District inspectors wherever necessary, the designation being at the discretion of the Prefect of

the district.
The law specified the criteria of designation as an engineering degree or practical experience as a managing director of a firm employing more than one hundred workers. The specification of these criteria is witness to the awareness of the legislators of the technicalities involved in the inspector's job.
The form of the inspection was specified in a Memorandum addressed to the fifteen inspectors (Circ. of 29th. May 1875) which states :

> *"The inspectors should draw their inspiration from the spirit of the goodwill and firmness which enlightens and advises rather than represses ; they should listen to complaints and claims which will be addressed to them, should explain the spirit of the law which is not to crampindustry but to ensure the intellectual and physical development of the child, in order to facilitate national progress Employers well informed" of the intention of the legislators, will understand the advantages of the law and thus they will make, hopefully, the necessity for procecutions very rare".*

The picture of the inspector at this point is a person competent enough to be able to sell the regulation's purpose.

Until 1892, only 20 districts out of 87 had appointed district inspectors ; the salary being too low in respect of the level of recruitment required. Manning was therefore not sufficient to cope with the situation in respect of the large number of factories concerned, as shown by the following figures : extracted from TOURNERIE (1971).

Numb. of Exist. Firms	Period	Numb. of Visits	Numb. of INFRACTIONS
133 000	1875 1890	600 000	4 000

TOURNERIE reported that the debate in Parliament regarded these figures as not satisfactory as only just one half of the factories were being visited each year. He quoted that 276 prosecutions were ordered in 1890, and 214 resulted in penalties, but the amount of the fine

was far too low to be of any significance. The author discussed the failure of the 1874 law on sociological and political grounds, some of which are mentioned in the study of Appendix I.
This situation led to the introduction of the law of 1892 in replacement of 1874 law. This law established a hierarchy in the inspectorate, with all levels under the state control. It established also entry examinations and competitive promotion examinations.

3.2. THE HIERARCHY

The inspectorate of labour is organised on a geographical basis : Regions, Districts, and Sections.
Regional inspectors reported to the Ministry of Industry and Commerce via a high commission established at the Ministry level. Labour inspection in Tranport was a separate branch of the Ministry of Construction, it is now a branch of the Ministry of Transport. The Mines, Quarries, Gas and Electricity formed a separate branch within the Ministry of Industry. On the establishment of the Ministry of Labour 1906 this branch was the only one which remained under the control of the Ministry of Industry.
Labour Inspection in Agriculture was established much later in 1938, under the control of the Ministry of Agriculture. It is still a separate branch of inspection.
The remainder of this work is devoted to the branch of the inspectorate now under the control of the Ministry of Labour. This represents 90 % of the workforce, the remaining 10 % being in Transport, Agriculture and Energy.

The current hierarchy of the labour inspectorate is shown in Figure 3.I.

There are 23 regional divisions, grouping 97 district divisions which contain 407 sections. Each section includes one inspector, two assistant inspectors and one secretary. The Assistant inspectors are called Labour Controllers, and will be referred to as controllers.

The organisation is on a geographical basis, one section is generally responsible for all the undertakings in its part of area.

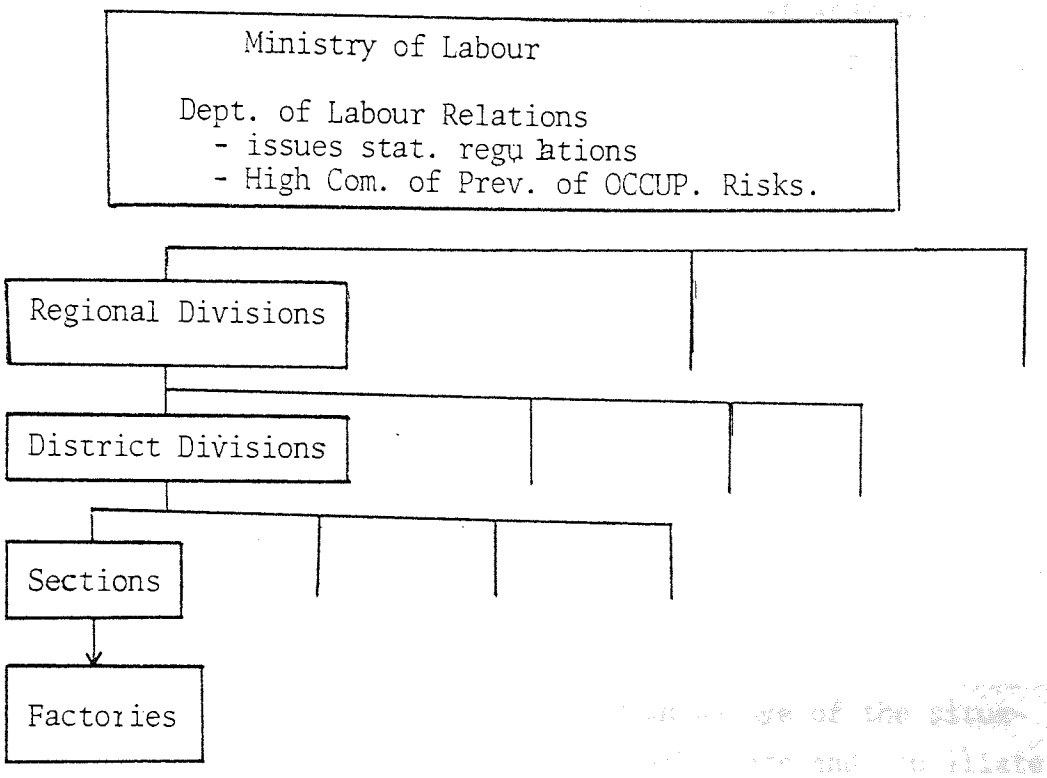

Figure 3.1 The Organisation of the Labour Inspectorate.

3.3 THE OBJECTIVES OF THE LAW

The objectives set out by the law of 1892 were as follows :

> *"The labour inspectors are charged with the execution of the present law..."*

Section V of the same law relating to safety and hygiene specified in articles 12 and 13 that the types of dangers subject to the law would be specified in appropriate regulations. This resulted in a flow of specific regulations on mechanical dangers, machinery, elec-

tricity, chemicals etc... The domain of activity remained safety and hygiene, but expanded as technology developed bringing with it new dangers and specified regulations, (see FOUCHER 1978).
The role of the inspector was confined to policing and enforcing the prescribed regulations. The courts considered that what was not explicitly expressed and prohibited by the regulations was allowed ; this imposed a limitation on the activity of the inspector as indicated for example by the very limited number of prosecutions, (see SEILLAN 1981).

In the period 1936-1938 (Minist. Memo 23/6/1936) and since 1947, the inspector was drawn in to deal with other domains such as employment, industrial relations and economics. There were two reasons for that :

-French society remained predominantly rural until the second world war, and there were a considerably higher number of small undertakings in comparison to the large ones. Hence there was a considerable resistance to the institutions of the Unions in the undertakings. The inspector was deemed the only person who had knowledge of the situation and was therefore in a good position to arbitrate and conciliate between management and workers, (see CHETCUTI 1976).
-The I.L.O.. convention (N° 81/1947) was ratified in France in 1950. Article 3 of the convention specifies that the inspector shall be in charge of the execution of the legal provisions relating to the conditions of work, and to the protection of workers in their jobs. The domains included in this article are : Periods of Employment, Payment, Safety, Hygiene, Welfare, Employment of children and other related subjects. The convention specifies also that the inspector shall provide information and advice to both employers and employees on all the regulations concerned with labour.
He shall notify the High autority of any deficiencies and abuses which are not covered by the regulations.

According to CHETCUTI (1977), the role of the labour inspector in France has been very much influenced by this convention. Indeed the study carried out by the inspectorate union (SNITMO 1970) reveals that throughout the period 1950-1970 the inspector was involved in

safety, hygiene, welfare, periods of employment, conditions of work, professional training, and accident investigation. The study indicated that the inspector was combining both policing and advising roles. It did not give indication of the relative importance of each area, nor the depth to which the inspector had been drawn in considering these problems.

The regulations currently in force are all contained in the Code of Labour. They cover nine large domains. Safety and Hygiene is one chapter in Labour Regulations domain. Article L 611.1 of this chapter is issued from the law of 1973 (10th. July) and sets out the objectives as follows :

> *"Labour inspectors are charged with overseeing the application of the requirements of the code of labour and the laws and regulations which are not included in the code of labour but which relate to the conduct of work".*

Articles L 232.1. and L 233.1. related to hygiene and safety respectively impose general duties on employers to their employees, and the inspector is required to carry these two provisions into effect. The employers'duties are set out as follows :

> *The establishments and premises referred to in section L.231.1 shall be maintained in a constant state of cleanliness and afford the hygiene conditions necessary to the workers' health.* (L 232.1.)
>
> *The establishments and premises referred to in section L.231.1 shall be so installed as to guarantee the workers'safety.*
> *The machines, mechanisms, transmission gear, tools and equipment shall be so installed and maintained as to afford the best possible safety conditions.*
> (L 233.1.)

As regards the breadth of the job of the inspector in health and safety, there is no doubt that the legislation intends to include all aspects within it. The statements of the law of 1892 are all inclusive and the subsequent legislation has not altered the spirit of these statements. As the legislation developed in this domain, the inspec-

tor was automatically recognised as the only person responsible for carrying into effect the provisions of the law.
From this point of view it is evident that the inspector is theoritically involved in at least three stages of the input-output model. He is involved in the prevention of accidents and occupational diseases arising from all types of dangers or at least all those that are known and covered by the regulations, though the employers'duties go beyond that as implied by the above statements. He should be able to perceive the danger during his visit to the undertaking, and bring it to the attention of the employer through an improvement notice or any other means he chooses to use. He should also be able to notice lack of compliance.

A memorandum of the Ministry of Labour (3/3/1952) required the section to plan one visit every year for each undertaking employing more than 50 employees, every two years for those employing between 10 and 50, and every three years for those employing less than 10 workers. In 1972 a reminder to this memorandum was addressed to the inspectorate stating the same figures, (see notification TE 5/72).

3.4. THE INTERPRETATION OF THE OBJECTIVES

I was granted access to the inspectorate services in two different regions in France with the object of consulting documents and interviewing serving inspectors in order to assess the exact contribution that an inspector is able to make towards the prevention of accidents and occupational diseases in an undertaking. The interviews were semi-directive and took 1½ to 2 hours each ; nevertheless the total time spent for every interview was one whole morning or one whole afternoon including the travelling time. Thus the number of inspéctors interviewed was limited to fifteen (8 inspectors and 7 controllers). I expressed the object of my visit in terms of the desire to collect general knowledge on the labour inspectorate and did not mention the specific purpose of assessment and evaluation of their activity. This was done to avoid putting inspectors on their guard. As the discussion went on I was able to throw in questions which were directly relevant to the information I needed. My interest was in five specific areas :

- The breadth of the activity (safety, hygiene, employment and whatever else they might mention in the discussion)

- The form of action (enforcement of the law, conciliation, arbitration, advice).

- The time spent in the undertaking (the frequency of visits, the form of the visit, and the length of the visit).

- The depth of the solution the inspector proposes to the undertaking and its nature.

- Competence (training received, nature of sollicited advice).

Permission for tape recording was refused on the first occasion, and was not requested again to avoid up setting the confidential character of the interview. Thus notes were made as the discussion went on.

The results will be discussed in the appropriate sections. The two first areas are directly relevant to the present section.

The talks were very interesting and very rich in information. Unfortunately there is no room in a section of this sort, to develop all the issues evoked during the discussions. The pattern of the discussions went in two perpendicular directions ; On the perpendicular line the inspector described his position in the hierarchy and the different lines of command and information and also the way he reported his activities to higher levels of the hierarchy. On the horizontal line he described his day to day activities. At the junction of the two lines he described his position as he saw it and as seen by his interlocutors -the employer, the employees, the chief inspector, and the court- emphasizing the fact that he has a particular role in virtue of his social position, in addition to his statutory position. The informations along the vertical line and at the junction were very pertinent and suggest further exploration from the sociological point of view, but this is beyond the scope of my interest and cannot be developed here. Thus I have concentrated on the horizontal line (though it was difficult to maintain the discussion on that dimension).

Although, as we shall see, there are now several domains transplanted into safety and hygiene, the inspectors remain very attached to these two. Indeed all the interviewees considered the prevention of accidents and occupational diseases as their main function. One inspector expressed this attitude in the following way :

> *"The essential and original function of the inspector of labour is safety and hygiene and the labour regulations. This remains, in my view, always the essential function though there have been plenty of other tasks transplanted on it and which take a lot of our time and have prevented us from carrying out this duty for so many years now".*

Safety and hygiene is now only one section in the Labour Regulations chapter, and so, as the inspectors declared, this is now unfortunately but one domain in their activity. They accepted that the labour regulations were the domain for which the inspectorate had originally been established and explained that the expansion of the social and economic elements of French society and the resulting legislation had shaped their role the way it is now. This fact is also confirmed in the literature (see BOIS 1982, CHETCUTTI 1977, BODIGUEL 1979, and I.L.O. Report 1981).

These authors support the idea that the role of the inspector is not only confined to the enforcement of the law, but it is also an advisory, a conciliation, and an arbitration role. The interviewees held this conception and quoted the latest Decree of 24th. November 1977 as enhancing these aspects even more. They noted that the Decree did not abolish the enforcement aspect. Furthermore the impression they gave was that their interpretation of the statutory regulations is more linked with enforcement and identification of lack of compliance, especially when they talk about safety and health. The picture was very confused between enforcement of the law and identification of lack of compliance. Indeed it was the latter that was referred to most of the time. These aspects of their job represent to them the most important constituent part of the function. The following statements are typical :

"The monitoring aspect in the undertaking, should be our systematic and regular occupation".

"There is a problem... which is difficult to reconcile the public expectations and the control function of the inspector. Undoubtly the public takes a lot of the time of the inspector in terms of information and arbitration of conflicts and this time is taken off the time".

Advice is given on matters of employment only, whilst for technical solutions the inspectors refer the employers to the expertise of the social security services (see next chapter).

3.5. THE RESOURCES

The resources provided to carry out the job are time as a function of manpower employed for the job, competence as a function of training and practical experience, and also the discretion allowed by the statutory regulations.

These are all statutory provisions and their analysis will allow a comprehensive picture of the quality of the role of the inspector to be made, thus giving an assessment of the depth of involvement in the job. The subject of analysis is only the part of the job that is concerned with the prevention of accidents and occupational diseases and so reference will be made to the elements of the input-output model.

3.5.1. MANPOWER

The manpower of the inspectorate expanded as the activities expanded, but the rate of expansion was rather irregular as can be seen in figure 3.2 The number of entrants each year gives a somewhat confusing picture ; very brief explanations may be found in (GARNOT 1981). The large fluctuations at the start of the graph are linked with the events and the consequences of the war. The author explains that the peak shown in 1946, for example, corresponds to the intake of people returning from the war, but she was unable to explain the relatively very low intake in the period 1948 to 1963 for example. It is difficult

to link the figures with the figures of the undertakings, as there is no data for that period. Though JAVILLIER (1975) quoted reports of Ministers in Parliament pressing for the need to increase the number of posts in the inspectorate ; the reports draw to the attention of the government that the increase in the number of undertakings must be accompanied by an increase in the inspectorate manpower.

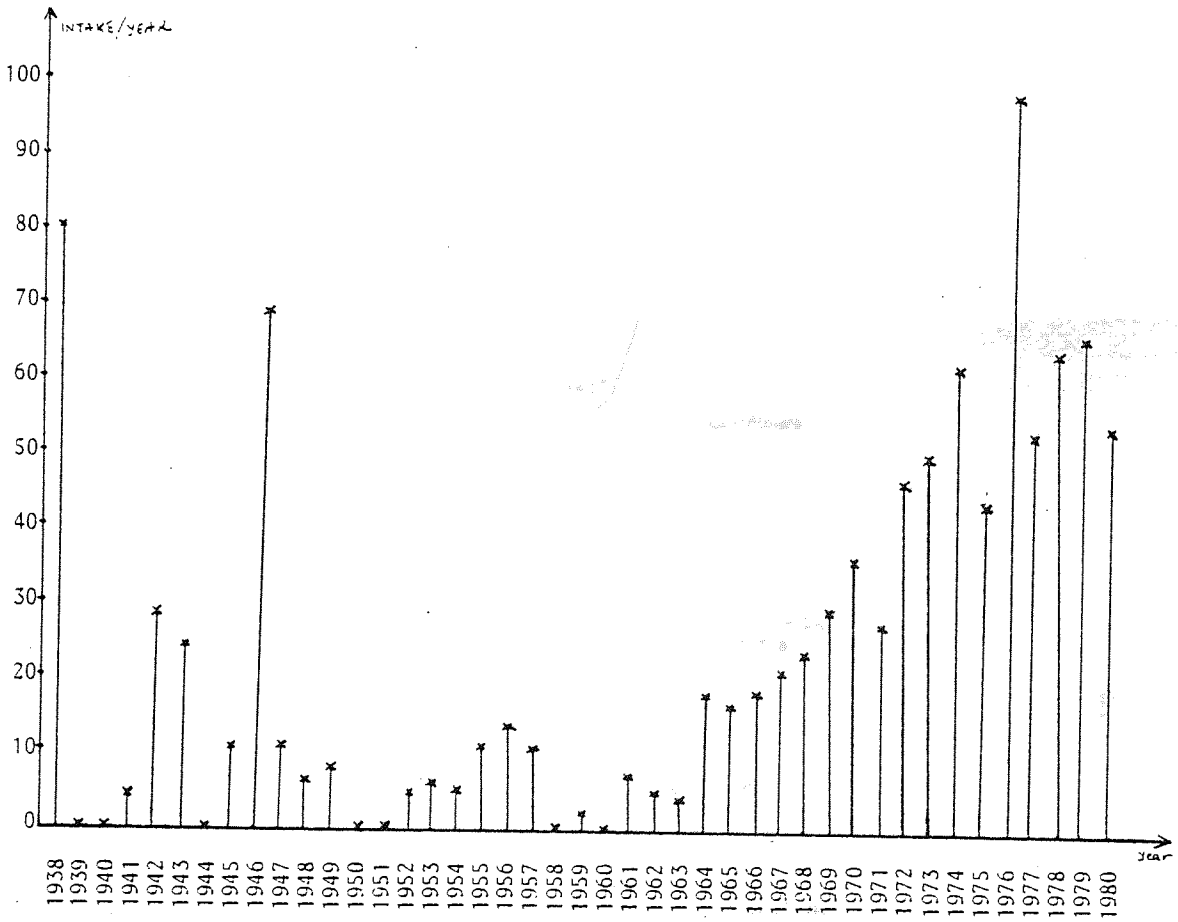

Figure 3.2. Rate of expansion of Inspectorate Manpower

The report of Parliament read in 1972 presented a figure of one inspector for every 40.000 employees. A similar report quoted a figure of one inspector for 42 800 employees for the year 1974. According to JAVILLIER, the objective was to get this figure down to one inspector for every 35 000 employees.

The evolution of the inspectorate manpower from 1972 is as shown in Figure 3.3.

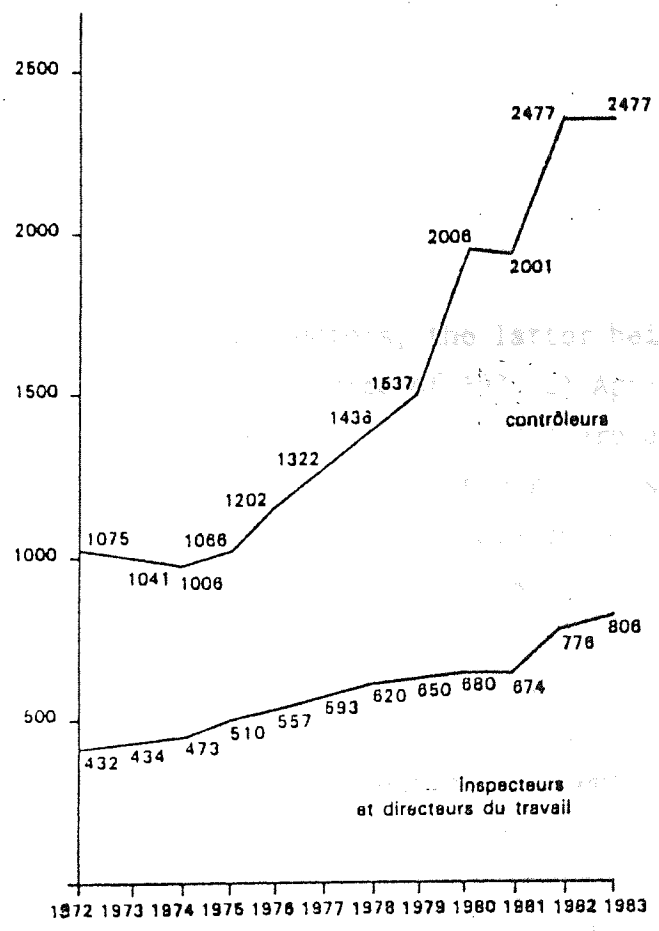

Figure 33 Evolution of Inspectorate manpower

The appointment of Labour Controlers, started in 1967 and by 1972 their number reached 1 075, the training problem seems considerable. It will be dealt with in a later section.

There has been a considerable increase in the number of inspectors (87 %) and controllers (130 %) over the period. The number of undertakings registered has increased by less than 10 % in the same period ; while the number of visits has only increased by 8,6 % from 1972 to 1979. Thus the increase in the number of the undertakings registered is not the main reason for the large increase in the inspectorate manpower. The number of advice actions increased by 37,5 % in the same period and so did the number of committee meetings attended (37,8 %). This implies a considerable office work. Indeed a study of the Ministry of Labour (1980) revealed that one half of the controllers were appointed tc administrative tasks, in the regional and districts offices. The other half were posted in the sections of the districts. The study revealed also that one third (1/3) of the inspectors were regional directors, and district directors. The other two thirds were heads of sections and deputy inspectors, the latter being a promotion grade recently introduced by the Decree of 1975(21 April). However it should be specified that the deputy inspectors are assigned administrative tasks related to employment, and their visits to undertakings are very rare and generally with the sole objective of conflict resolution and conciliation (see ILO TMLI 4 1981).

The number of inspectors involved in undertakings visits is not given in the inspectorate reports, but it can be calculated from the fact that there is one inspector for each section (as mentioned earlier). Table 31 shows the number of inspectors involved.

The number of sections having increased by 73 % in the period 1971 to 1983 the number of undertakings per section should theoretically have dropped as a consequence.

In practice the situation is somewhat different as the allocation of sections is a function of the number of employees in the area. Thus there are sections covering up to 4 000 undertakings and others with

Year	Nb. of Sect.
1966	191
1971	233
1975	270
1980	376
1981	400
1982	403
1983	405

Table 3.I Evolution of Inspectorate Sections (Figures extracted from internal documents of Ministry of Labour).

only 2 000 undertakings. Furthermore for reasons of competence and credibility which will be discussed later, the inspectors deal with undertakings of more than 50 employees and the controllers are concerned with the smaller ones, although the controllers refer to the inspector in complicated matters such as conflict resolution and prosecution cases, as revealed in the interviews.

The objective of the Memorundum of (3/3/1952) mentioned earlier has never been reached as in 1982, for example, only 18 % of the registered undertakings were visited, 9,3 % of which belonged to the category of undertakings employing more than 50 workers, 24,3 % to the category employing between 50 and 10 workers and 66,4 % belonged to the category employing less than 10 workers (see Inspectorate Annual Report 1983). It might appear that the very small undertakings are the target undertakings in the activities of the inspectorate, because of the highest percentage they represent here (66,4 %). My enquiry on this point revealed that it was not the case, but it was due to the fact that this category of undertakings represents more than 70 % of the total number of undertakings in France (see C.N.A.M. Annual Report 1983).

During the interviews the inspectors declared that the controllers were much more involved in visits and monitoring than the inspectors

by a figure of 3 to 4 times as much. The Inspectorate annual report (1982) shows about 50 visits per inspector per year and 165 visits per controller per year. The reason for this state of affair will be explained in a later section.

It seems that the labour inspectorate are very limited in manpower to be able to deal with the large number of undertakings for which they are responsible.

3.5.2 THE COMPETENCE

Recruitment of inspectors has always been through competitive examinations as established by the law of 1892.
Candidates were taken from all backgrounds at a Baccalaureat level (British A level). The content of the examination subjects were at first predominantly technical but were later changed to include more literature and law and to reduce the technical topics. For example the 1893 examination contained three papers ; two papers in machinery guarding and pressure vessels and one paper in law, the 1925 examination included four papers : Labour law, Civil law, French literature and mechanics or electricity (see CHAILLE 1982). Passed candidates were assigned their jobs straight afterwards and no other training was provided.

The administrative amalgamation of the three inspectorate bodies (Labour, Agriculture, and Tranport) unifying the statutes of the different categories of inspectorate personnel in the three branches (Decree of 21/04/1975) resulted in the creation of the National Institute of Labour (Institut National du Travail). This institute provides training courses for newly recruited inspectors, and also refrecher courses to serving inspectors.
The current entrance examination is open to graduates from all backrounds and exceptionally to second year graduate students in law. This special favour may be understood with regard to the content of the examination subjects, which includes four papers presented in the following way :

Subject	Time	Weight
Econom. & Sociology	5 hs.	4
Labour Regulation	4 hs.	3
Manag. Or Techno. Or Biology	3 hs.	3
Working Conditions	4 hs.	3

The paper on working conditions is generally a case study requiring basic knowledge in safety, hygiene, ergonomics, mechanics, electricity, chemistry, and biology (see Comment Devenir Inspecteur du Travail 1982).
Clearly the examination is predominantly around Social Science and Law with the possiblility that less than one third is in technology and biology. In fact briliant candidates in the first two papers may pass the examination without much knowledge of technology and biology as they can choose the management paper in the third category. In 1980 for example, 46,6 % of the candidates were from a law background, 26 % from economics, 13 % from Social Science and only 6,8 % from engineering.

The training course is of 18 months duration ; teaching covers the first 10 months and practical training the remaining 8 months. The content of the syllabus shows that Safety and hygiene represent only one third.

During our visit to the Institute, the director declared that there has never been a full time teaching staff in the Institute. Lecturers are hired from universities, industries, civil service, courts, the inspectorate and industrial physicians. This raises the question of coordination and coherence in tube subject which has been discussed in the previous chapter in connection to health and safety. The director declared that he has extreme difficulties in organising and running such a course and this situation affects to some extent the quality of the course. These difficulties have been r ised in the

publications of the Ministry of Labour (see Echange Travail 1982 for example). The report of the I.L.O. group (ILO 1981) drew similar conclusions and stated that the inspectors of labour in France are not engineers.

The controllers take shorter training courses of 5 months duration, half of which is practical trainings in regional and district offices and in visits with inspectors ; the remaining half is taught material and the syllabus takes the same shape as the inspector's but is shorter and at a lower level.

Only a few of the interviewees (5/15) admitted openly that they have difficulties related to their competence during their visits to work-places. They declared that the demands of the employer were sometimes very technical and specific. The other interviewees answered my query by stating that in such cases, they refer the employers to the services of the social security funds.
However an analysis of a sample of 300 inspectors' applications for in service courses revealed that 52 % of the applicants chose a training course in engineering (noise, machinery guarding, electricity, cranes and pressure vessels) ; in terms of inspectors working in sections this percentage was even higher (83 %).

The need for backup from technical experts was expressed as early as 1937 (see ROTHAN 1982). However it was only provided in 1947 in relation to occupational diseases. The law of 16 January 1947 created new posts for industrial physicians within the inspectorate body and provided for the inspectors to refer to them to decide on prosecutions related to occupational diseases (see art. L611.7 and R611.4 of Code of Labour). Currently there is one such post in every regional inspectorate office.

The need for engineering backup was recognised much more recently, and the law of 24 November 1977 provided for the appointment of engineers in the regional and district offices. But the law did not specify the number of posts and left the decision entirely to the discretion of the regional director. It stated :

"The regional director may appoint consultant engineer to be assigned specific tasks."

The result is that so far only 12 posts have been provided, and their main tasks are defined as follows ; (see CASTAGNE 1982)

- Training and information
- Explanation of technical regulations (electricity, mechanics, chemistry...)
- Provision of guidance in matters related to the conditions of work.
- Assisting regional and district directors in specific case studies involving technicalities.

The author mentioned also that these consultant engineers had also been involved in visits to undertakings with inspectors and ccntrollers.

This situation is leading to the creation of a new branch of the inspectorate. Some suggestions for such a branch and its work have already been made but in a very tentative manner (see BOIS 1982). The consultant engineer, at present, is acting as a consultant with not much power and discretion, as opposed to that of the inspector and controller which are very extensive.

3.5.3 THE POWER AND DISCRETION

The inspector and the controller have the right of access to the undertaking at any working time, (Art. L611.8 Code of Labour). Furthermore article L631.1 states :

"Anyone putting obstacles in the way of the inspector or controller of labour in the accomplisment of their duties is liable to imprisonment for two months to one year and/or a fine of 2 000 to 20 000 Francs."

The former article specifies also that the inspector or the controller may proceed to sampling and analysis of chemical products used in the undertaking. This is one example, where the inspector has to use his competence and judgment as to what sort of analysis and sampling are required and what is needed to be established.

In the majority of such cases the inspector requires the information from the manufacturer of the product. The limitations to such a procedure are considerable. The manufacturer does not always provide sufficient information ; he will generally provide such information as the trade name of the product and its constituents and probably its composition. JEANTELET (1981) reported that this power is widely used, but he criticized it for its major drawbacks.

The other source of information available to the inspector is the prevention service of the social security funds, however as JEANTELET reported, these services are generally reluctant to deliver information in connection with such cases for fear of loosing face with the employers. They therefore refuse to get involved in the inspector's use of his power. Furthermore they see prevention as part of their job as will be discussed in the next chapter.

3.6. THE ACTUAL ACTIVITY CONTENT

A better guide to the breadth of the job of the inspectors may be gained from the reported infractions of the requirements of the Code of Labour and the prosecutions taken under them.

The Table3.2 shows the three main activities of the inspector, namely Advice, Conciliation, and Monitoring.Under advice are counted the number of people visiting the regional or district inspectorate offices to seek advice, and also the number of letters sent from the offices in reply to requests from employers, employees, and unions. The content of the advice is purely on legislation ; this kind of advice is set up to avoid management versus workforce conflicts (see annual report 1978 for example). Under conciliation are grouped the number of meetings which the inspectors attended, the object being to negotiate a management/Workforce Convention or assist in solving a conflict. Monitoring is measured in the annual reports by the number of factories or establishments visited by the inspector or the assistant inspector. According to the declarations in the interviews the purpose of the visit is generally to assess the undertaking on all the aspects of the

relevant regulations set out in the Code of Labour (consultation of the statutory documents and an inspection tour in the plants).

Yr.	ADVICE		CONCILIATION		MONITORING		
	VISITORS	MAIL	CONFLICTS	C.H.S.	UNDERT. REGISTERED	UNDERT. VISITED	%
1971:	754,188	468,898	2,899	4 590	913,502	202,014	22
1972:	779,440	459;520	2,968	4 627	928,462	198,621	21,4
1973:	743,479	500,877	2,953	5 043	907,074	269,624	29,7
1974:	805,390	516,062	3,044	6 001	925,628	276,779	29,9
1975:	995,321	649,562	3,350	6 121	870,799	272,637	31,3
1976:	870,033	628,512	3,136	5 876	973,286	269,657	27,7
1977:	912,678	691,009	2,715	6 175	974,468	203,920	21
1978:	698,216	726,430	2,523	6 647	989,687	214,841	21,7
1979:	921,645	806,337	2,548	6 381	994,321	215,742	21,6
1980:	988,603	858,377	-	-	1,040,131	242,903	23,3
1981:	885,923	838,127	-	-	1,050,269	222,427	21,1
1982:	824,128	804,746	-	-	1,053,173	190;329	18

Table 3.2 Activities of the Inspectorate

(Data Compiled from Inspectorate Annual Reports : Travail Informations ; Ministère du Travail-Service de presse).

The figures presented in Table 3.2 are extracted from the inspectorate national reports published by the Ministry of Labour. Assuming that one visit takes half a day, according to the inspectors interviewed; Committee meetings, discussion on a conflicting problem, writing up a mail advice, and discussing with visitors take as much time. The use of the working time will be discussed more thoroughly in the next section.

Advice to visitors and through the mail increased by 9,2 % and 71 %

in the period 1971/1982. The inspectors interviewed reckon that this part of their activity is very time consuming, as it involvers information searching and providing convincing arguments to visitors. One inspector said :

"We are becoming a professional law consultancy"

The meetings in the C.H.S. and other Unions/management Commissions are also time consuming and the inspectors gave an estimate of half a day per meeting including traveling time. They reckoned that they can hardly provide one third of their working time to the visits in the undertakings. They indicated that advice and conciliation are a much more aspect of their activity than control.

The situation has considerably changed with respect to the period of inception of the inspectorate of labour if we look at the following declaration reported by VILCHIEN (1981) in an interview with a retired chief inspector :

> *"In the period prior to the war, the general rule was 100 visits per inspector per month which meant 5 to 6 visits a day and about 1 500 a year. The number of inspectors then was 100 and the total number of visits reached 150 000. The conciliation and advice activities took place at the inspector's home, as there were no inspectors offices, and an indemnity of 500 Francs was established in 1935 to allow for the time and effort that the wives incurred for the reception of the visitors".*

Considering that the legislation at that time was mainly concerned with health, safety and working conditions (see appendix I), the majority of the working time and especially the time of the visit was entirely devoted to these aspects compared to less than one third today, when the inspector has to deal with all the issues covered by the Code of Labour in the same visit.

Table 33 is also extracted from the inspectorate annual reports. The infractions appear under eight separate headings as shown in Table 3.3.

. The first heading "employers duties" appears as such on the report format, but it actually includes only duties to report accidents

and new recruits, to keep noticeboards updated with information concerning the workforce and to keep the statutory registers updated.

Yr.	Employers Duties	Periods of work	Salary	Unions Institutions	Safety & Hygiene	Employ-ment	Holidyas	Others	TOTAL
1972	9,347	71,459	65,968	5,548	198 026 (44 %)	34,910	12,475	50,829	448,562
1973	10,381	68,573	62,717	5,346	261 647 (50 %)	31,508	9,687	64,939	514,808
1974	44,560	97,192	59,438	7,565	302 483 (53 %)	34,064	12,834	11,526	569,682
1975	102,647	67,020	57,261	7,930	309 895 (50 %)	60,661	13,420	127	618,968
1976	106,455	63,398	50,808	9,126	314 273 (51 %)	60,190	11,829	163	616,242
1977	142,796	60,358	58,858	10,969	372 243 (50 %)	54,382	13,656	24,466	739,728
1978	157,022	63,265	64,553	12,693	435 313 (52 %)	61,089	13,692	30,235	837,862
1979	182,067	73,966	74,554	13,621	505 835 (52 %)	69,980	15,092	39,157	974,272
1980	195,933	73,165	80,519	13,283	553 472 (52 %)	79,699	14,563	41,716	1 052,350
1981	196,619	69,814	71,603	13,329	507 268 (52 %)	70,492	14,023	38,321	981,469
1982	161,968	61,837	66,387	12,099	411 250 (51 %)	47,720	13,540	37,073	811,874

Table 3.3 The number of infractions from 1972 to 1982 (figures for 1971 were not avail)

The heading "Unions Institutions" means the infraction due to non-establishment of an obligatory commission, or committee such as the health andsafety committee, for example. The other headings are self explanatory.

The figures reveal the quantitative involvement of the inspector with aspects of safety and hygiene compared to other domains. They show a fairly steady trend of 50 % infractions in safety and hygiene, and 50 % in the seven other domains. The infractions in safety and hygiene are classified in the inspectorate reports in the manner presented in Table 3.4.

There is no indication as to what comes under "General Aspects" and

Workers saf. & Hyg.	No. of Inf.	%
- General aspects	197,190	44,6
- Women's & Children's Labour	1,791	0,4
- Regulations related to particular Professions	64,451	14,6
- Spec. Reg. related to Const. Indust.	38,021	8,6
- Prosecutions without improvement notice	2,780	0,6
- Machinery Guarding	28,149	6,3
- Labelling of Chemical Products	1,183	0,2
- Safety & Hygiene Committee	6,322	1,4
- Occupational Medicine	67,757	15,3
- Gen. Reg. related to Soc. Sec. Funds.	3,942	0,9
- Others	29,664	6,7
TOTAL	441,250	

Table 3.4. Classification of infractions in Safety and Hygiene as shown in the annual inspectorate report (Figures taken from 1982 report).

what comes under "Others". The remaining titles are clearly related lack of compliance to specific regulations. These are ones which specify precisely what is required and do not need much interpretation on the part of the inspector or controller. This classification does not show clearly the difference between Safety and Hygiene, but apparently most of the infractions are related to regulations in safety, which may reflect the ease of perception of lack of compliance in this area.

The proportion of infractions which relate to safety & hygiene is relatively high, 50 % of the total number of infractions (see Table 3.3) but the severity of the sanctions is relatively very low as indictated by the following figures :

	1979	1980	1981	1982
Numb. of Prosecutions	24 350	28 644	26 479	22 267
$\frac{\text{No of Pros.}}{\text{Tot. Infrac.}} \times 100$	2,49	2,71	2,69	2,70

Table 3.5 Rate of Prosecutions.
(Figures extracted from Ministere des Affaires Sociales DRT et Rep. Min. JO.QR.AN. 1° Nov. 1982 P.4 528).

Furthermore, the amount of the penalty is most of the time equal to or less than the minimum specified in the regulations which indicates some lack of support on the part of the court. The annual inspectorate report quoted a figure of 74 % for the penalties which were less than minimum for the year 1980.

The lack of the courts support may be interpreted as an incitement to conciliation and advice rather than to control and sanctions. There is no official proof of this assertion although it is clear from the spirit of some statutes mentioned earlier.

3.7. DISCUSSION

The data and anlysis presented so far indicate that the inspectorate of labour was the first central government agency responsible for ensuring the application of the provisions of the Labour Code, the laws and regulations not embodied in the Code that relate to working conditions and the stipulations of Collective Agreements that have been the subject of an extention order. Their function was first established in relation to the prevention of accidents and occupational diseases to the labour force ; however their role has been a changing and expanding one since the beginning of the century and it is continuing to evolve with changes in technology, industry, government policy and the resulting regulations and statutes.

They have often been seen as the right or indeed the only people to take new functions resulting from these changes.
In theory the inspectorate is responsible for monitoring, advice and conciliation in safety and health and have the right discretion and power to intervene in this field, and therefore it could well be argued that their intervention should cover all the elements of the input-output model.
In practice their intervention is limited by a number of obstacles :

- The expansion in manpower did not match the expansion of the domains of action and the corresponding regulations, and did not take place at the same time. The important expansion in manpower took place in the mid-seventies as shown in figure3.2 that is relatively

recently. An important part of manpower was assigned administrative tasks and therefore the expansion in manpower did not have a consequent effect on in-plant safety and health ; the percentage of undertakings visited has remained practically the same for the last decade or so (about 20 %). The depth of the visit can only be very shallow because of the number of issues that have to be considered in one morning or afternoon.

- The economic and social aspects in the undertakings have changed, bringing with them a tremendous number of collective agreements, orders and regulations which have been brought under the control of the inspector of labour. The figures related to advice, mail, conflict and conciliation are an indication of the importance of these issues in the inspector's activity.

- The training of the inspectorate is not technically adequate for the objectives of their role in occupational health and safety. The content and depth of such a training have been dicussed in the previous chapter as pre-requisites to fulfill the needs of each element of the model. Only a minor percentage of these appear in the training syllabus of the inspectorate.

Considering the foregoing analysis and the preceding factors, it may be concluded that the contribution of the inspectorate to in-plant safety is far from meeting the input needs specified in the model. It was mentioned earlier that the inspectors see safety and hygiene and especially the monitoring aspect of it, as the original and main constituent element of their profession. Their major claims expressed in the annual reports in connection with their activity is shortage of manpower. A vast increase in manpower would be needed in a relatively short period of time in order to cope with the numerous domains in which the inspectorate are involved. Such an increase would bring about new problems within the inspectorate body, (e.g. BODIGUEL 1981 reported major conflicts of a sociological nature and different conceptions in the methods of work between the old generation of the inspectorate and the generation appointed in the mid-seventies).
In addition, the prevention of accidents and occupational diseases necessitates a large body of knowledge and expertise, to permit satisfactory intervention and contribution to be made to in-plant sa-

fety and health. This in turn needs a lengthy and specific training. The inspector is a graduate and takes a special course of 18 months duration ; broadening his training syllabus to include a specific course in safety and health could extend the training duration to three or four years. The difficulties of running such an extended course are obvious and it could be argued that graduates, rather than going on such a course would prefer to take higher university degrees instead.

A reduction in the existing syllabus to allow for inclusion of the safety and hygiene course would create dificiencies in competence in other domains at the cost of producing an expert specialised in safety and hygiene. People of this profile already exist in France (I.U.T. graduates) but are not employed in the inspectorate because they do not satisfy the administrative entrance requirements.

CHAPTER 4

THE ROLE OF THE SOCIAL SECURITY FUNDS

The history and the principles of emergence of the social security system in France, have been reviewed by DUPEYROUX (1969), and by JAMBU-MERLIN (1970).

The object of this chapter is to pinpoint the various aspects of the contribution of social security bodies to in-plant occupational safety and health and evaluate its efficiency.

The study reviews the principles leading to the inception of the institution, analyses the statutory regulations defining its objectives and assesses its contribution in terms of competence and time allowed to people (engineers and controllers) intervening in the undertakings. The analysis of the regulations will be as described in the methodology chapter. Part of the data is drawn from the annual activity reports and the remaining are from a case study of one regional social security fund.

4.1 THE EMERGENCE OF THE SOCIAL SECURITY

The necessity to compensate for injury suffered by workers in the course of their employment became apparent a long time ago. However the current form of compensation was evolved during the first half of the century. The various phases of the evolution are summarized in Figure 4.I; it shows the replacement of the traditional system of the employers' liability by the principle of social insurance.

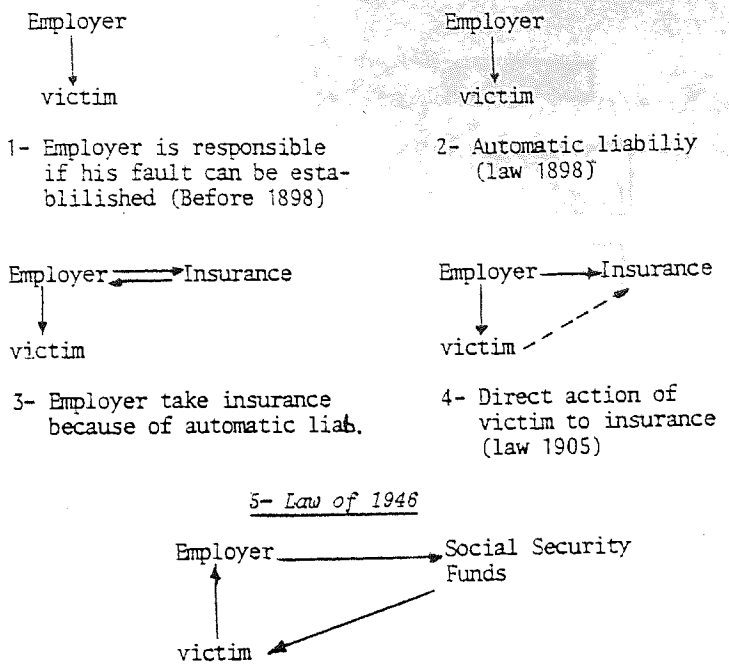

Figure 4.1 Phases of evolution of the Soc. sec. System in France.

Before 1898, the employer was held liable only if his fault could be established. The law of 1898 (9th. April) established an automatic employers' liability under all circumstances ; this represents the start of the insurance bodies. The injured worker claimed compensation from his employer, but the employer claimed refund from the insurance. The law of 1905 (31st. March) established a direct link between the insurance body and the victim ; it provided for the victim to take legal action against the insurance body. The last phase of the evolution is due to the law of 1946 (30th. October), it established the *Caisse Nationale de l'Assurance Maladies*, (National Disease Insurance Fund), and the *Caisse Regionale d'Assurance Maladies*, CRAM, (Regional Disease Insurance Fund). It also established the *Service de Prévention*, (Prévention Services) in each C R A M. The principal actors in the prevention services are the *Ingenieurs Conseils* and the *Controleurs* (Consultant Engineers and Controllers) as they are the persons in charge of the contribution of the C R A M to in-plant safety and health in undertakings. Other means of contribution are financial and will be dealt with in a later section of this chapter.

The organisation of the social security system is as shown in Figure 4.2.

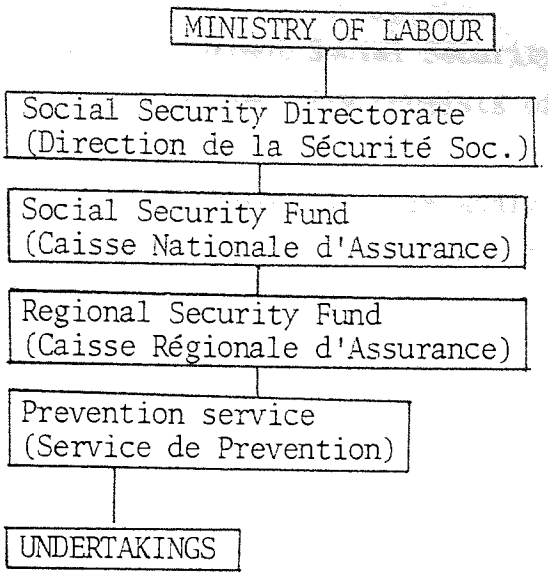

Figure 4.2 Social Security Organisation.

The organisation is somewhat similar to that of the labour inspectorate especially at the undertaking level, that is there are the *ingenieurs conseils* and the *controleurs* of the C R A Ms intervening in the undertakings to contribute to in-plant safety and health. The analysis of the objectives and the activities will show further similarities and also the differences between the two institutions.

4.2 THE OBJECTIVES

The joint principles of compensation and prevention are really inherited from the spirit of the law of 1898. Indeed the law encouraged workers to make special efforts in the field of prevention in the sense that the employers' duties of compensation were very limited and time lost due to accident was compensated at only half the normal working rate or salary. It was intended to incite workers to take more care at work as accidents were believed to be due to workers' want of care.

The current principal Acts devoted to the social security are the law of 1946 and one section in the law of 1976 (6th. Decemb.) both of

which are included in the current Social Security Code. The remainder of the legislation on social security consists of four Memoranda from the Ministry of Labour.

Articles and paragraphs of these texts are analysed and classified according to the elements of the input-output model.

In the following, Table 4.I sections, paragraphs, and articles contained in the acts and memoranda are related to corresponding phases in the input-output model. Thus a section reading... *"proceeds to the study of all the problems related to prevention..."* would be classified as having to deal with all the sequences of the model and therefore would show under A, B to G in the table. Whereas sections dealing with accident investigation and/or inspection would be related to the perception sequence and would show under C. A section dealing with a financial contribution in terms of cheap loans will be classified under the implementation sequence F.

As to the domains concerned, the expressions *"Prévention des Accidents et des Maladies Professionnelles"* (prevention of accidents and occupational diseases) used in the Social Security Code, like *"Hygiene et Sécurité"*, (Hygiene and Safety) used in the Labour Code, is taken to include everything related to safety and health of people at work (see Appendix I).

The table contains also a "discretion" column indicating the relevant sections in the statutory regulations which are characterised by expressions like "judge", "may invite employers to take actions" etc... These evoke a process of interpretation and decision on the part of the ingenieur conseil or controleur.

Clearly the legislator intended that the prevention services of the C R A Ms should cover all aspects of health and safety in the undertaking. Indeed article L422 for example reads like this :

"Les caisses regionales peuvent faire procéder à toutes les enquêtes qu'elles jugent utiles en ce qui concerne les conditions d'hygiène et de sécurité. Ces enquêtes sont effectuées par les ingenieurs conseils et les controleurs de sécurité prévus à l'article L148".

This means the C R A Ms may proceed to all investigations related to the conditions of safety and hygiene, which they judge useful. These investigations are carried out by the consultant engineers or the safety controllers provided for in article L148.

LAW - ACT MEMO	A	B	C	D	E	F	G	DISCRETION
LAW 30 Oct 1946	PREVENTION OF ACCIDENTS AND OCCUP-DISEASES		L.422 L.421	L.421 L.431	L.421 L.424	L.421 L.425 L.426 L.427 L.429 L.432	L.424	L.420 L.422 L.424 L.426 L.427 L.431
MEMO 05 March 1977	Par 7	7	7	7	7	7	7	3 & 8
MEMO 05 March 1948	Par 2	-	-	-	-	-	2	-
MEMO 11 Sept 1963	Par 3	3	3	3	3	3	3	-
MEMO 06 May 1965	I.b II.I	I.b II.I	- -	I.b II.I	I.b III.b	- III.II	II.I III	II.II III
LAW 06 Dec 1976	PREVENTION OF ACCIDENTS AT WORK			ART.25	ART.26 ART.29	ART.24	ART.27	ART.24 ART.26

Table 4.I · Sections of the regulations specifying the objectives of the role of the Soc. Sec. in the Prevention of Acc. & OCC. Dis.

This article is classified under C, as an investigation is generally to discover sources of danger. It is classified also under "discretion" because of the discretion given to the *ingenieur* and *controleur* in the expression "which they judge useful". Furthermore all articles of the law of 1946 cover all aspects of prevention of accidents and occupational diseases and as such all the articles are classified under A and B.

The number of sections in the legislation devoted to the implementation phase is large as shown on the table because of all the forms of financial contribution which the C R A M can make to promote in-plant safety and health.

4.3 THE INTERPRETATION OF THE OBJECTIVES

A study of the National Security Fund leaflets and of the C R A Ms annual activity reports reveal that one of the main objectives of the C R A Ms is to promote informational and training activities to encourage safety mindedness. The CRAMs help the management of undertakings to be more aware of the nature, frequency, and severity of occupational accidents and diseases. The notification of accidents enables the C R A Ms to throw light on the circumstances and causes of the

accidents or occupational diseases reported, to analyse and process them statistically and to make the results available to all concerned. On the basis of the knowledge thus acquired, the C R A Ms can prepare and disseminate material for information or publicity campaigns, or for the use of undertakings for their own plant safety campaigns. The C R A Ms can help in safety training schemes by providing instructors and teaching aids. They also participate in safety courses organised by trade unions and industrial associations. They collaborate in the preparation of factual and instructional background and facilities for broad sector information programmes such as for the press, and television.

Representatives of the C R A Ms attend health and safety committee meetings in the undertakings to give advice. This is a recommendation of the law of 1947 related to health and safety committees (see appropriate chapter).
Research work is also carried out, for undertakings which do not have the necessary facilities, in the laboratories of the CRAMs.

Most of all the consulted documents emphasize technical assistance in the from of advice, workplace inspections, guided tours, talks, lectures, sampling and monitoring of harmful agents. These activities are available on the request of the undertakings or on the initiative of the C R A M.

From a theoritical point of view, there is no doubt that the objectives set out by the statutes are very well covered by the interpretations presented so far and the remaining sections will be concerned with the analysis of the resources provided in order to carry into effect these objectives. The analysis will consider such aspects as hardware facilities, manpower, discretion and competence. The study will use data collected in a particular case study in one C R A M. The description of the case study and the method of collection will be given in the appropriate section.

4.4 THE RESOURCES

4.4.1 THE NATIONAL RESEARCH AND SAFETY INSTITUTE (I.N.R.S.)

The National Security Fund has set up the *Institut National de Recherche et de Sécurité* (The National Research and Safety Institute) with a staff of 494 researchers, engineers, physicians, ergonomists, psychologists, information scientists, edithors, etc... The institute makes studies and investigations of the principal occupational hazards and the corresponding preventive and protective measures, either by literature searches, on the spot investigations and enquiries in industry, or laboratory research.

It collects and disseminates a vast documentation and also acts as a training and teaching institution for the *ingenieurs conseils* and *controleurs* of the C R A Ms.

The institute provides technical advice to the prevention services of the C R A Ms, to individual undertakings and to the public authorities. The research on the current role of the health and safety specialist (chapter I) revealed that only large firms with a proper health and safety set up and employing a health and safety specialist make use of the facilities provided by the institute. A good appreciation of the efficiency of the role of the institute in in-plant safety and health needs further detailed investigation. However considering that 80 % of the undertakings in France are small (employing less than 100 workers and do not possess a proper structure for health and safety) it is hard to imagine that they make an extensive and beneficial use of the institute's facilities.

4.4.2 MANPOWER

The evolution of the manpower (ingenieurs and controleurs) of the C R A Ms over the last two decades is as shown in the Table 4.2. Access to data prior to 1963 was not possible.

The number of ingenieurs conseils and controleurs has doubled during this period and the number of the undertakings registered has increased by 26 %. This indicates the will of the social security organisation to increase the manpower in order to cope with the task of the C R A Ms in addition to the increase in the number of undertakings.

Year	UNDERTAKINGS	STAFF		
		ENG.	CONTROL	TOTAL
1963	1,038,086	101	197	298
1964	1,038,187	109	201	310
1965	1,077,445	123	210	333
1966	1,070,554	125	211	336
1967	-	123	216	339
1968	1,118,061	130	232	362
1969	1,114,944	133	244	377
1970	-	132	246	378
1971	1,114,964	132	249	381
1972	1,132,169	136	258	394
1973	1,139,067	144	260	404
1974	1,147,143	142	261	403
1975	1,151,937	154	291	445
1976	-	157	287	444
1977	1,153,994	166	303	469
1978	-	200	300	500
1979	1,270,279	202	375	577
1980	1,310,422	200	373	573
1981	1,310,442	200	375	575

Table 42 Evolution of Manpower of the CRAMs (data compiled from annual activity reports of the Nat. Sec. Fund)

Assuming that each *ingenieur conseil* or *controleur* is responsible for a certain number of undertakings, it can be seen that the number of undertakings per *ingenieur* or *controleur* was 3483 in 1963 and dropped to 2279 in 1981. However the ratio remains still very high if we consider that each undertaking has to be visited at least once every year. Indeed if one *ingenieur* or *controleur* devotes his whole working time to the visits of the undertakings and assuming that each visit takes half a day, less than 1/4 of the total number of the undertakings can be covered during the year. In practice these figures are even lower, the 1981 annual report for example, quoted 25745 in-plant interventions by ingenieurs-conseils and 174,153 by the

controleurs. Thus on average every *ingenieur* makes 128 visits to undertakings, and each *controleur* makes 464 visits, that is about four times as many. The figures suggest that the *controleurs* are more involved in in-plant safety through visits than the *ingenieurs conseils*. The details of the actual organisation of the work will be dicussed in the case study.

The *ingenieurs-conseils* and *controleurs* have the right of entry into all undertakings under exactly the same conditions as the labour inspectors (see art. L148 of the Code of the Social Security), and any obstruction may subject its author to penalties and emprisonment. In addition a general discretion is allowed over all the activities as indicated earlier, Table 4.I . They can also issue improvement notices for non-compliance with the social security regulations and/ or the labour regulations. They may also draw the attention of the inspector of labour to such infringments, (Art. L424 of the Soc. Sec. Code).

4.4.3 COMPETENCE

In terms of competence there are obviously two categories : the ingenieur-conseil and the contrôleur. The former is a graduate engineer with a minimum of 5 years industrial experience prior to entry into the C R A M ; the latter, on the other hand, has a very much less stringent condition of recruitment, he must have 3 years industrial experience and no other qualification is required of him. Both categories are required to attend a training course specifically organised at the I N R S. The training is of eight weeks duration, the syllabus is the same for both groups but differently organised on each course to suit the intellectual level and background of each group.
The syllabus document produced by the I N R S, sets out the objectives of the course as follows ; (see syllabus 1983 INRS).

- *help the engineer or controller to discover his role and function, particularly :*
  - *. the different functions assigned to him*
  - *. the human relations involved in these functions*
  - *. the possible actions open to him*
- *allow him to aaapt himself to the new role which is assigned to him.*

The organisation and the content of the training are as shown in Table 4.3. The table shows the topics covered and the contact hours. The course is run by 12 lecturers, the majority of whom are hired from institutions outside the INRS, including five serving ingenieurs-conseils, two serving labour inspectors, two training specialists from INRS, one industrial physician, and two engineers from industry. The course is obligatory but there is no examination to check that the training achieves its objectives. The ingenieurs and controleurs are confirmed in their posts after the training. It is a course of 124 contact hours covering a wide range of topics. Although half the time is devoted to technical subjects, the number of contact hours devoted to each of them is very limited and does not permit it to be covered in any significant depth. Discussions with serving *ingenieurs-conseils* and *controleurs* reveal that this training course is really designed to teach the trainees their methods of work for their day to day activities.

Occupational Accidents	6 h.
Work Station Analysis	17 h.
Occupational Diseases	4 h.
Physical Hazards	11 h.
Chemical Hazards	12 h.
Machinery Garding	7 h.
Role of the C R A Ms	28 h.
Construction & Pub. Work	7 h.
Safety Organisation	3 h.
Legislation	11 h.
Economics	4 h.
Information & Training	10 h.
TOTAL	124 h.

Table 4.3 Training organisation and Content.

Other resources are the funds available to the C R A Ms, enabling them to make financial contributions to in-plant safety and health. They grant very cheap loans to undertakings embarking on major occupational safety and health improvements or on research programmes for new preventive measures or their implementation and testing in the

workplace. This will be discussed in the Case study.
At this stage there is evidence that both the manpower and their training are somewhat short of the requirements of their would-be job in the undertakings in terms of advice and investigations claimed in the objectives and their interpretations as presented earlier. To probe this deficiency further, there was therefore a need to carry out a more detailed investigation of the activities of the staff concerned.

4.5 CASE STUDY

There are sixteen C R A Ms in the whole country, one in each region. A detailed study of all of them was impossible for practical reasons. Each region is organised in the same way and hence a detailed study of one was deemed sufficient. Through the Department of Safety and Hygiene of Bordeaux university, access was gained to the C R A M d'Aquitaine.

4.5.1 ORGANISATION

The organisation of the prevention service of this C R A M is as shown on the chart of Figure 4.3.

The service contains two main departments, one responsible for activity of general interest and the other responsible for the monitoring activity in the undertakings.

The general interest department contains six sections, responsible for the activities expressed by the titles shown on the chart. The inspection department contains four sections organised in very much the same way as the sections of the labour inspectorate described in the preceding chapter.
The whole prevention service contains 49 people involved in technical and administrative tasks as illustrated in the chart ; there are also two part time industrial physicians. It can be seen that there are only 5 ingenieurs-conseils and 13 controleurs in the monitoring department who are actually involved in the visits to the undertakings. The number of undertakings covered by the service is 68,702 employing

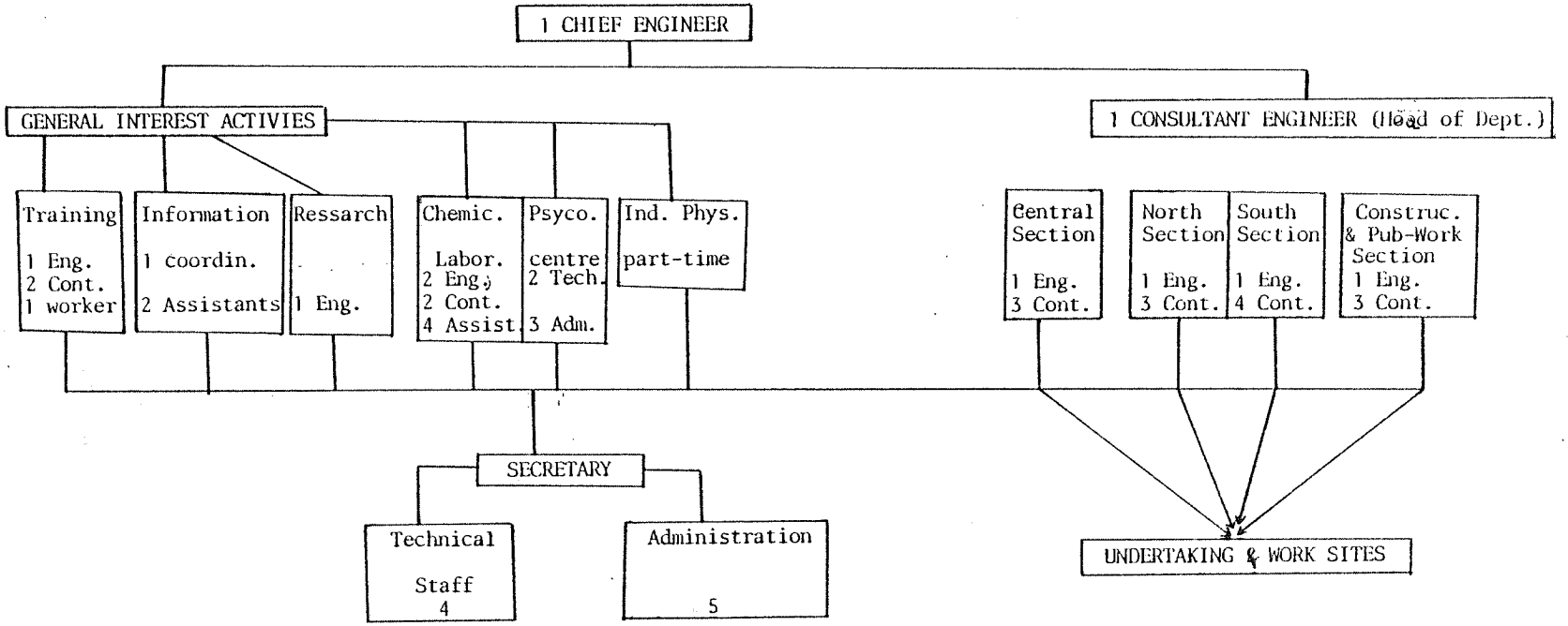

Figure 4.3 Organisation of CRAM Prevention service

575,017 workers and hence the theoretical ratio of undertakings to one ingenieur or controleur is 3,816.

4.3.2 CONTENT OF INTERVENTION

In order to know the actual activity of the ingenieurs and controleurs, a better guide is to analyse their "intervention" in undertakings. An intervention is defined as an activity unit which is used as a measure of the effort of the ingenieurs and controleurs in the annual report of the C R A M. It is a unit of a half day of work by an ingenieur or controleur in any factory or worksite. An intervention may have one or many objectives. The internal code of conduct of the C R A Ms stipulates that the objectives are to be classified in the following categories :

- *"Inventory and analysis of dangers specific to the factory visited.*
- *Monitor measures and solutions already recommended.*
- *Investigation of an accident or an occupational disease.*
- *Sampling and testing of equipment.*
- *Assistance in drawing up safety policy, in design studies and in installation of equipment and machinery.*
- *Assess merit rating to allocate loans and adjust contribution rate.*
- *Sit on health and safety committees meetings in undertakings*

Clearly this list of objectives confirms the interpretations mentioned earlier. Furthermore, these objectives cover all the elements of the input-output model. Inventory and analysis of all dangers related to factory suggests that the ingenieur or controleur should be concerned with all aspects of health and safety, that is phases A and B and also C and D. Monitoring of previous recommendations is phase G. Accident investigation may be under C and D. Sampling and testing are also under C and D. Safety policy, design studies and installation of machinery are included in the techincal solution phase. Committee meetings will depend on the content of the meeting and hence it may be

classified under any of the phases of the model.
This classification establishes the breadth of the activity as perceived by the C R A M. It is again tempting to conclude that the C R A M takes care of every aspect of in-plant safety and health through the intervention of its ingenieurs-conseils and controleurs.

4.5.3 EFFICIENCY OF INTERVENTION

Figure 4.4 is constructed from the data from the C R A M annual activity reports ; it shows the evolution of the number of the undertakings in the region of Aquitaine affiliated to the C R A M, over the last decade and half. It shows also the number of the undertakings visited and the number of interventions of the ingenieurs and controleurs every year. In these reports the interventions are classified according to the industrial standard classification. There are fifteen types of industrial and non industrial activities. The number of interventions in each type of activity indicates that 30 % of the interventions of the controleurs and ingenieurs are concerned with construction and public work, 20 % in metal manufacture and the remaining 50 % in other types of industries and activities ranging from 10 % to 0.3 %. Approximately the same percentages can be found in the annual activity reports of the National social security fund based on the activities of the 16 CRAMs ; (See for exemple CNSS report 1981).
The ingenieurs and controleurs thus devote half their effort to construction and metal manufacture industries, which are the two types of activities with the highest accident frequency and severity rates, (see CNSS reports 1972 to 1982).

The figures of the graph indicate that less than 1/10th. of the undertakings are being visited every year. This figure is even lower from 1976 onwards, but on the other hand the total number of interventions increased slightly from that date.

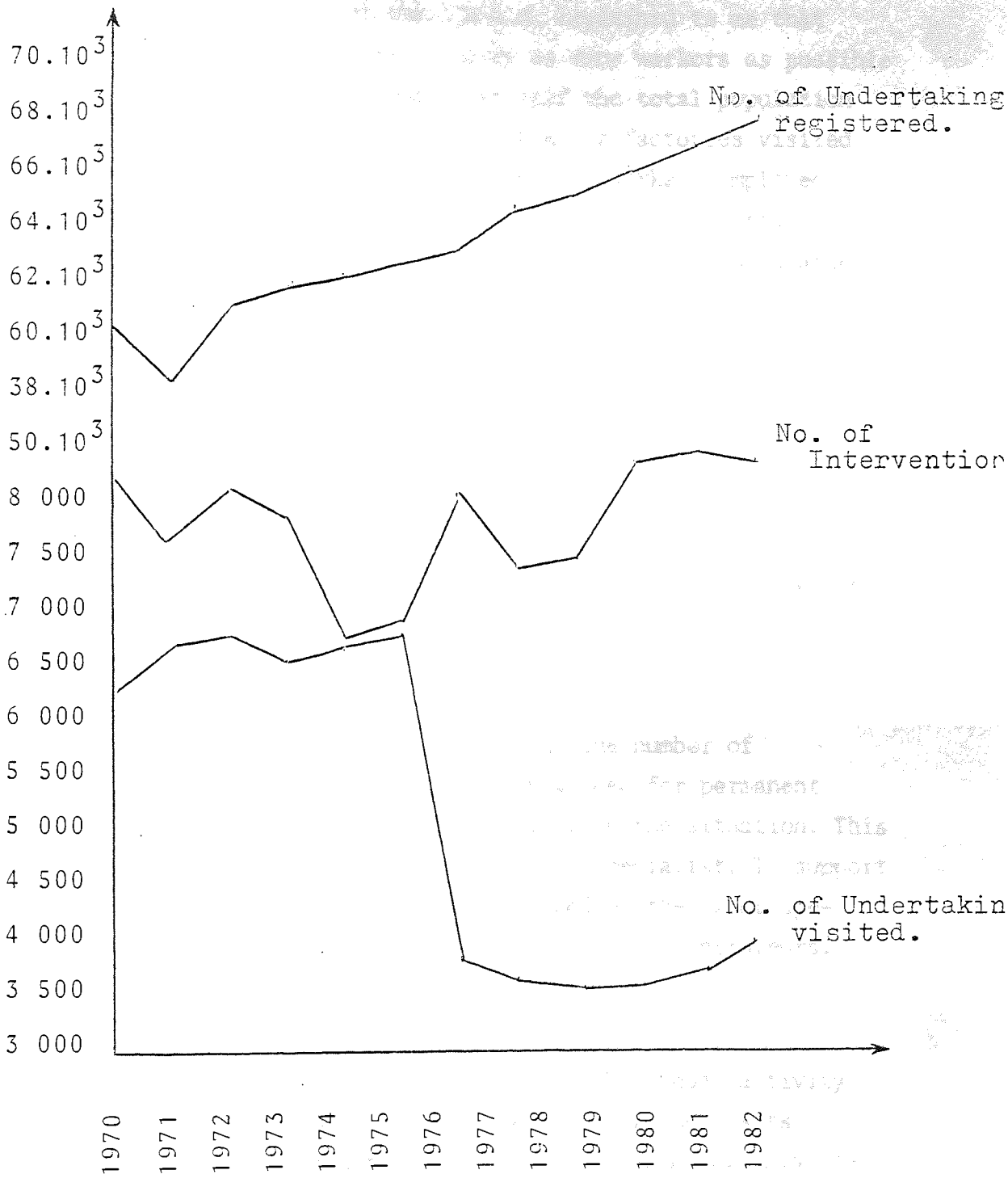

Figure 44 Evolution of no. of undertakings, no. of visits of No. of interventions

The ingenieur-conseil adjoint of the C R A M, explained to me that the objective of their activity is to cover as many workers as possible with the visits, but that every year over half the total population of workers is left out. The selection criteria for factories visited are the accident frequency rate and the number of workers employed in the undertaking. The idea is thus to give advice to factories with the greatest problem and so to minimize the compensation charges (SAUTOU 1985).

Table 4.4 shows the undertakings selected for visits for the year 1983. The squares crossed out indicate the types of sites not scheduled for visits. It can be seen that there are undertakings which have a frequency rate above average in the region and which have not been selected. SAUTOU explained that this is the best that can be done in respect of the manpower available. He also explained that their recent policy tends to prefer "concentrated actions" which means that some undertakings with particularly serious problems in safety and health were visited 2 to 3 times the same year, by the same ingenieur or controleur or both. This explains the drop in the number of factories visited and the increase in the number of interventions. SAUTOU admitted that there was a need for permanent contact with these types of undertakings to improve the situation. This implies a need for a permanent health and safety specialist. To support such a statement, further investigation is needed of the exact specifications of the interventions of the ingenieurs and controleurs.

4.5.4 SPECIFICATION OF INTERVENTION

The data presented in Table4,5 were compiled from the annual activity reports and classified according to the objectives of the visits ennumerated earlier and related to the elements of the model. Discussion with SAUTOU and his colleagues enabled clarification of the interpretation to be made so that I could classify them according to the elements of the model. It is clear from the earlier section that the object of the visit covered all aspects of safety and health in the particular worksite and thus phases A and B of the model were included in every visit, as were other administrative aspects stipulated in the social security code, such as the employers

Accident frequency rate		Size of undertaking				
		0 to 10	11 to 20	21 to 50	51 to 100	> 100
0 to 60	Total Number of undertakings	6 489	238	185	67	45
	Undertakings with AFR > AFRR	0	15	34	11	12
61 to 100	Total Number of undertakings	18	65	51	17	6
	Undertakings with AFR > AFRR	5	31	19	5	3
101 to 200	Total Number of undertakings	146	61	58	12	14
	Undertakings with AFR > AFRR	119	45	38	7	5
> 200	Total Number of undertakings	424	34	23	5	3
	Undertakings with AFR > AFRR	222	33	23	5	2

Table 4.4 . Selection method of controllers and engineers visits to undertakings

duty to report accidents to the C R A M etc... These are therefore not included in Table 4.5.

PERCENTAGE OF ACTIONS RELATED TO EACH STAGE OF THE MODEL

Year	1979		1980		1981		1982	
	Ing.	Cont.	Ing.	Cont.	Ing.	Cont.	Ing.	Cont.
Total No. of actions	1067	10014	947	9192	1018	9841	747	10025
C	55 %	64 %	71 %	72 %	72 %	64 %	65 %	66 %
D	59 %	65 %	63 %	73 %	61 %	65 %	65 %	67 %
E	19 %	36 %	11 %	9 %	9 %	28 %	6 %	1 %
F	11 %	54 %	7 %	46 %	5 %	52 %	13 %	37 %
G	10 %	29 %	8 %	20 %	11 %	28 %	12 %	28 %

Table 4.5 . Objectives of Actions of Engineers & controllers of CRAM d'Aquitaine (1983)

In Table 4.5 the interventions of the ingenieurs are separated from those of the controleurs. The figures show that the controleurs are much more involved in the visits than the ingenieurs (more or less 10 times as much). Indeed SAUTOU explained that the routine inspection visits are generally carried out by the controleurs, whilst the ingenieurs are called in to deal with specific problems or to support the controleur's actions in convincing employers about an improvement measure deemed necessary by the controleurs.
The percentages do not total to 100 in any direction because one visit may have several objectives as mentioned earlier. Overall both the ingenieurs and controleurs are very much involved in perception (60 to 70 %) and analysis of danger (65 to 75 %), but to a very much smaller extent in other phases of the problem solution process (10 to 20 %). This reflects the aspect of inspection and monitoring which is predominant in the activity of the ingenieurs and controleurs when visiting plants and working sites.

The figures in line G indicate that the controleurs are more involved in the monitoring phase, than the ingenieurs ; they check that the recommendations made in the previous visits are carried into effect by the employer.

4.5.5 NATURE OF DANGER COVERED

Permission was granted to carry out a deeper analysis of the activities of each controller in the C R A M d'Aquitaine. Permission for a similar analysis for the ingenieurs was refused on the ground that they merely backup the actions of the contrôleurs and would therefore show the same patterns. This assertion should be subject to verification especially in view of the differences in emphasis shown in Table 45. However this could not be done in this study.

The analysis was focussed on the content and nature of the recommendations made during their visits to undertakings throughout the year 1983. The recommendations of 11 controleurs were looked at and classified in the six domains shown in Table 4.6.

Controleur	No. of visits	Mail Sent-out	No. of recommendation	Electricity	Handling	Pressure vessel	Mach. Gard.	Fire	Hygiene	Other
1	411	291	1 267	19 %	9 %	7 %	28 %	16 %	3 %	18 %
2	381	263	1 017	19 %	12 %	6 %	28 %	9 %	1 %	25 %
3	377	176	390	24 %	11 %	2 %	18 %	9 %	3 %	33 %
4	491	293	941	28 %	9 %	6 %	19 %	16 %	2 %	20 %
5	469	231	723	19 %	11 %	4 %	24 %	17 %	1 %	24 %
6	253	161	648	13 %	17 %	5 %	23 %	12 %	0,30 %	29,7 %
7	614	198	576	19 %	14 %	8 %	30 %	11 %	0,30 %	17,7 %
8	540	199	554	13 %	10 %	3 %	34 %	8 %	0,90 %	31,1 %
9	400	188	517	23 %	12 %	6 %	25 %	13 %	1 %	20
10	363	142	674	28 %	13 %	9 %	7 %	27 %	2 %	14
11	315	151	521	20 %	8 %	6 %	22 %	14 %	1,30 %	25,7 %

Table 4.6 Activity of controleurs of CRAM in 1983 (data compiled from recommendations issued)

From the figures, Table46, there is an average of 420 visits per *controleur* in the year 1983 ; considering that there are about 225 working days in a year, it would be reasonable to conclude that some visits took even less than half a day, as no *controleur* would spend the whole year inthe visits. This gives a rough guide on the depth of involvement which can be achieved.

The other category contains recommendations concerned with non compliance with administrative aspects stipulated in the code of the security, which are not related to prevention of accidents and occupational disease in the sense described in the model.

The figures reveal that over 70 % of the recommendations made by every controleur were related to aspects of safety and only 1,5 % were concerned with aspects of hygiene. Furthermore, of the 70 % of the recommendations, half were related to dangers from electricity and machinery, which are the two demains which are extensively documented in the statutory regulations, as indicated in appendix I. Again there is an indication that the contrôleurs are mainly concerned with lack of compliance with the regulations, and that the ones related to machinery and electricity (indeed the safety aspects in general) are more easily detected in comparison to the ones related to hygiene which involve considerable time in detailed analysis such as atmospheric sampling and analysis.

Whilst no evidence can be presented about the actual distribution of problems existing in the firms visited, it is reasonable to conclude that the controleurs have confined their activities largely to carrying into effect the statutory provisions and particularly those that are clearly specified. Their role has therefore been shown to be reduced largely to a monitoring process in limited domains of prevention of accidents and to a much lesser extent of occupational diseases. Further issues will be raised in the discussion section.

4.5.6 IMPLEMENTATION OF PREVENTION STRATEGIES

It was indicated earlier that several sections of the regulations could be classified under the implementation phase of the model be-

cause they are related to financial encouragement of employers to take more preventive actions. Some are direct contributions in terms of cheap loans to finance a health and safety programme lûnched in an undertaking, others are indirectly expressed in the rating assesment of contributions payable by the firms to the social security funds. The C R A M consider that by carrying out individual assesment of the level of danger in an undertaking and by rating its financial contribution on this basis, the employers become aware of the direct and indirect costs of accidents and occupational diseases.

Thus they take action to reduce the financial burden due to the increase in the contribution rate imposed by the C R A M . This increase may be as much as 200 % of the initial rate. The C R A M has also the authority to decrease the rate subject to noticeable improvements in safety and hygiene in the undertaking.

In practice an increase in financial contributions or *"SURPREMIUMS"* can only be imposed on a compagny after improvement notices have been issued. However the number of improvement notices has always been very limited compared to the number of recommendations made. The activities of the controllers studied reveal that only 200 improvement notices were issued in 1983. This is just about 2,6 % of the total number of recommendations made. The number of cases where this increase of rate can be imposed is therefore limited. Table 47 shows the number of cases where an increase or decrease of contribution was actually put into effect by the C R A M over the last decade or so. It shows also the number of loan grants.

The figures indicate that at most, the increased rate sanction was only used in less than 50 % of the improvement notice cases, (see 1983 figures for example). Furthermore, in more than 80 % of the rate increase cases, the increase did not exceed 25 % of the initial contribution rate, as opposed to the 200 % possible in theory, (see CNSS report 1982 for example).
Also from Table 47, it can be seen that the number of cases where a decrease in the rate of contribution was put into effect was also very limited. In 1982, for example, only 8 undertakings out of 3 000

Year	Cases of increase	Cases of decrease	Cases of loan gra.
1970	121	24	0
1972	97	32	0
1975	113	10	0
1976	170	17	0
1977	100	1	1
1978	68	13	2
1979	55	16	3
1980	54	14	4
1981	55	8	3
1982	78	8	3
1983	80	7	4

Table 4.7. Summary of financial instigation Scheme of the C R A M d'Aquitaine.

(Data compiled from annual activity reports).

visited that year, were granted this decrease because of their good accident records. The main problem with this aspect is due to the method of measurement of organisation performance in prevention of accidents and occupational diseases. The social security institutions still use the criterion of accident frequency rate and the severity rate, the limitations of which have been discussed in a preceding chapter.

4.6 DISCUSSION

The limitations of the financial contribution of the C R A Ms to in-plant safety of undertakings have been analysed by ENCELLE (1982). He quoted that 85,3 % of the funds of the C R A Ms were used in compensation of injured, and ill workers, 13,5 % were used in the management of the C R A Ms and only 1,2 % in the prevention safety scheme ; (Rapport CNAM 1981). The author suggested a modification of the criteria of performance assessment of the safety level in the undertakings in order to utilise the financial resources available to the C R A M in a more systematic and extensive way.

The foregoing sections high lighted further limitations in terms of

competence and time actually allocated to solve the health and safety problems in any undertaking.

It was not possible to study the individual competence of the controleurs as this would have required a separate and personal test of each individual. However an indicator has already been given of the initiated background necessary prior to recruitment.

The main role of the controleurs has been shown to be the identification of lack of compliance as indicated by the very high percentage of their activies falling in phases C and D of Table 45. The two phases are perception and analysis of danger which in most of the cases, are carried out through inspection tours in the plant.
The content of the recommendations confirms that the advice given on solutions is very superficial. It is generally an indication of non compliance, refering to specific articles in the code of labour or the code of social security.

This role bears strong similarities with the role of the labour controller, discussed in the preceding chapter. It was already mentioned that the ingenieurs conseils and controleurs have the same discretion and power of access to undertakings and power of access to information as the labour inspectorate. The main difference is that the training of the inspector is less extensive than of the *ingenieurs-conseils*. And it was mentioned in the preceding chapter that the inspectorate is now recruiting engineers as consultants to the inspectors.
Ministerial Memoranda have continually been concerned with the distinction between the roles of the two controllers, (see Memo 25th. March 1947, 5th. March 1948 and 11th. Sept. 1963). These texts of legislation have recommended the use of combined efforts from both professionals in terms of visits and exchange of information. It has already been mentioned that the CRAMs were reluctant to grant the release of information requested by the inspectorate (see previous chapter). The only exchange of information which was mentioned during the discussion with the ingenieurs conseils of the CRAM was the notifications on improvement notices issued (which is a statutory

obligation). A very curious phenomenon was revealed in connection with this. When the inspectorate are notified of the visit of the CRAM staff to an undertaking they do not inspect that undertaking. The reason that was mentioned was that the inspectorate considered that a visit carried out by members of the CRAM was sufficient to pick up the deficiencies in health and safety. It could well be argued that this is also an implicit recongnition of the identity of the two jobs and hence of the inspection aspect in the role of the ingenieurs conseils and controleurs.
During the discussion, it was clear that the ingenieurs and controleurs regarded themselves as consultants and advisers since they kept refering to their official title "Ingenieurs Conseils". They explained that although they have the same powers as the inspector of labour, they try not to exert this power in order to get collaborative response from the employer. Indeed it was indicated that, in practice, the ingenieurs and controleurs prefer to make visits by appointment with the employers well in advance. It can therefore be argued that, in this way, employers may carry out health and safety campaigns few days before the controleur's visit and the visit will therefore take the form of an assessment of that campaign ; no more, no less. Some controleurs did not hesitate to confirm this observation during the discussion.

These two views of the role of the CRAM could be considered to be in contradiction. The inspectorate, the employers and the workers, appear to regard them as equivalents or alternatives to the inspectorate, while the CRAMs regard themselves as advisors.

The detailed study demonstrated that althrough the legislation required the *ingenieurs-conseils* and the *controleurs* of the CRAMs to intervene in every aspect of in-plant safety and health and in theory the objectives were well interpreted, the limitations in manpower and competence have modified the actual activities of the *ingenieurs-conseils* and *controleurs* and confined them largely to the inspection aspect. The reality therefore seems closer to the inspectorates view of CRAM than their own self image.

CHAPTER 5

THE ROLE OF OCCUPATIONAL MEDICINE

This chapter is an attempt to demonstrate that the legal framework which established occupational health services in France "diluted" the role of the industrial physician to the extent that he is legally required to deal with nearly all aspects of occupational safety and health. He may therefore be in a position to claim jurisdiction over the entire domain of prevention of accidents and occupational diseases.
The study shows that such a dilution reduces the efficiency of the role of the industrial physician in his contribution towards the prevention of accidents and occupational diseases.
Reference is made to the Input-Output model to establish the breadth and depth of the job as established by the legislation and also to show the limitations of the resources available.

Evidence is provided through literature and a specifically designed survey.

5.1. THE LEGAL FRAMEWORK

Although concern about occupational health and safety in France started with the law of 1841 regulating the child labour, it was not until 1946 (the law of 11 October) that occupational medicine was introduced and regulated. Subsequent legislation on occupational medicine was concerned with its extension to all types of activities. By 1952 it became compulsory to provide a service in all insdustrial and commer-

cial activities. Transport activities were included in 1955. Collieries and Quarries in 1959, Agriculture in 1966 ; Domectic work surch as Janitor of public building, warders and house keepers in 1971 and part time labour in 1972.

Provisions of the law of 1946 have recently been replaced by the law of 20 March 1979 ; but as will be shown there has not been much change in the description of the role of the industrial physician. Both of these laws are codified in the current Code of Labour. In the first law 6 articles out of 31 (20 %) are devoted to the role of the industrial physician, the majority (80 %) is devoted to the organisation and structure of occupational health services. In the 1979 law there are 18 articles out of 58 (30 %) devoted to the role of the industrial physician. Between the two periods there has been official Memorunda issued from the Ministry of Labour, all of them provided explanations of the 1946 law. Two of them are particularly relevant to this study and are therefore included in the analysis.

5.1.1. THEORETICAL JOB DESCRIPTION

In Table 5.I , the letters A, B, to G refer to the elements of the model, namely the nature of danger (A), that the industrial physician is required to deal with, whether it is related to existing hardware or personnel or on the other hand new equipment or people newly recruited. The letters C to G indicate the depth at which he is required to get involved. In the vertical direction of the table are listed in a chronological order the main relevant provisions included in the current code of labour which are issued from the laws of 1946 and 1979. Articles of these laws are systematically analysed and identified under the corresponding letter(s). Thus article R241.41 of the law of 1979 reads as follows :

> *"The occupational physician is the adviser of the employer or his representative, of the workers and their representatives and of the welfare services especially on the following aspects :*
>
> *1°) Improving welfare and working conditions inside the factory,*

ARTICLE	Nature of danger A			Mode of Access B		PERCEPTION C	ANALYSIS. D.	CHOICE OF SOL. E	IMPLEMENTAT. F	MONITORING G	DISCRETION
	ENERGY	CHEMIC.	ORGANISATION	INNOVATION	WEAROUT						
D 241.14			✓	✓		✓					✓
D 241.15			✓		✓	✓					✓
D 241.16	✓	✓	✓	✓		✓	✓	✓			✓
D 241.18			✓				✓				✓
D 241.21	✓	✓	✓		✓	✓					
D 241.22	✓	✓	✓	✓		✓					✓
R 241.41	✓	✓	✓	✓	✓	✓	✓	✓			
R 241.42	✓	✓	✓	✓			✓				
R 241.44		✓			✓		✓				✓
R 241.45	✓	✓	✓		✓				✓		
R 241.47	✓	✓	✓	✓	✓	✓					
R 241.48			✓	✓		✓		✓			✓
R 241.49			✓		✓					✓	✓
R 241.50			✓		✓					✓	✓
R 241.51			✓		✓	✓	✓				✓
R 241.52			✓		✓	✓	✓				✓

LAW OF 1946 — Médical-Examination — Hygiène — Monitoring

LAW OF 1979 — Action on work place — Médical examinations

Table 5.I. Theoritical Job as by Law.

2°) General hygiene of the establishment,

3°) Adjusting working techniques, posts and rhythms to human physiology

4°) Protecting workers from all aspects of harm and more specifically dangers from occupational accidents and dangers associated with use of dangerous substances.

5°) Hygiene of the canteen and dining halls".

This article shows under (A), because number 4 in the article states all aspects of harm ; occupational accidents and dangerous substances. Number 1 in the article also states improving conditions and it may therefore be taken to mean all aspects of organisational conditions developed in the elements of the model ; this is another reason to include this article under (A) in all columns ; Number 2 is a general statement on all aspects of hygiene and may go under A in two columns chemical and organisation. Number 5 goes under organisation. Number 3 is an indication of the degree of involvement that is required of the industrial physician. Indeed in this case he is required to advice as is indicated at the begining of the article and therefore his involvement is at least as far as choice of solution, obviously after recognition of danger and analysis.

Considering the whole article, it is legitimate to say that it requires the industrial physician to be involved in all aspects of prevention of accidents and occupational diseases and also welfare. The expression "He is the adviser of" does not imply a strict obligation, nor does it specify the quality of advice and leaves therefore a large discretion with the physician.

As it can be seen, Table 5.I , the articles related to the medical examinations are nearly the same in both laws, (indeed they are written in more or less the same words). They do not show under "Energy" and "Chemical" columns as in this case the action of the physician is on the human only and in the majority of the cases the examinations take place outside the work site, in occupational medicine centres. Examinations are intended to detect any anomaly in people to be recruited. These articles are included under organisation because physiological

and psychological states are included in this phase of the model. Article D241.16 concerns people being examined after a period off sick or as a result of an accident ; the article states that the physician carries out this examination with some knowledge about the working situation of the individual being examined. This in fact is the first idea though not explicit, of the involvement of the physician with the work place. Articles D241.21 and D241.22 are concerned with hygiene. They are general articles including all aspects of hygiene in all the workplace. This, again implies action of the physician in the workplace, but nowhere in the law is it specified how, when or what domain is included. The type of involvement of the physician is not specified either.

It was not until 1969, that the action of the physician in the workplace was made explicit in the texts. A memorundum of the Ministry of Labour (13 Jun 1969) indicated two wain areas : "a study of the workplace" and "analysis of dangers relevant to the activity of the undertaking he is in charge of". In this memorundum the legislator suggested that one third (1/3) of the working time of the physician be devoted to his action in the workplace (see Circ. du 20 jun 1969). This was only a suggestion with no legal power and therefore the action of the physician remained caracterized by the periodic medical examinations only (see TARGWLA 1976).

The law of 1979 enhanced the principle of the action in the workplace a little more and the first subsection is very explicit (art. R241.41 to R241.47). The domains of action are more explicit and are repeated in all the articles as indicated on the table. The degree of involvement goes as far as analysis. Article R241.45 is related to the health and safety meetings and the industrial physician's presence in these meetings requires him to be involved in the discussions about implementation of solutions. This article was therefore identified under the implementation column of the table.

The conclusion gained from this analysis is that the industrial physician is required to deal not only with the clinical but also

the workplace aspects of occupational health and safety.

5.1.2. DISCRETION

Table 5.I provides also a column indicating the discretion allowed to the physician to carry out his job. Indeed the legislation maintened that the physician is "the adviser" of all the parties concerned with safety and health, and in all its aspects. Furthermore there are specific terms which indicate the degree of discretion in every article, for example the end of article D241.15 reads like this : "...*le medecin du travail est juge de la frequence des examens medicaux...*" namely the industrial physician appreciates the frequency of the medical examinations needed. It could be argued that this is his domain of activity and he is the competent person to judge on this problem. However article R241.44 states that the industrial physician may order technical investigations to be carried out in the workplace. He may do it himself or designate some other expert to do it for the undertaking. Theby employer is required law to provide the necessary facilities the physician may require to carry out his action in the workplace (art. R241.47).

Having established the breadth of the job of the industrial physician and the degree of discretion that he has to carry out this job, it is necessary to explore whether he is in a position to fulfil these requirements. The aim is not to chalenge him on the clinical aspect of his activity as this is his domain of competence. It is his action in the workplace which needs examination as this is the area where he shares the activity with other intervening bodies like the social security funds prevention services, the labour inspectorate and the health and safety service of the organisation (in organisations where there is one). The analysis is carried out in terms of limitations of resources especially the competence and time available.

5.2. ANALYSIS OF THE RESOURCES

5.2.1. COMPETENCE

Originally general practitioners were authorised to practice occupational medicine and in fact this is still the case in Departments overseas like Guadeloupe, Martinique, and la Reunion (art D822.10 Code of Labour).
Occupational medicine courses were officially introduced in France in 1977 (Arreté du 16 Mai 1977). Currently physicians wishing to practice occupational medicine must hold a certificate in occupational medicine, though it is still not obligatory for physicians who were practicing occupational medicine before the 23rd. October 1957 in France or those who praticed in Algeria before the 1st. July 1962. Both the lateness of the law about training and the transitional provisions relating to the "grand-father clauses" are an indication of the lateness of awareness of the legislator about the specificity of the domain of health and safety.

The new regulations specify that at the end of the course the candidate should pass three examinations : the first paper includes pathology, hygiene and toxicology the second paper includes physiology, sociology and ergonomics and the third paper includes legislation and statistics. There is no mention of technology and safety.
Analysis of the syllabus of the course of occupational medicine delivered in French universities shows that it is a two year course of 100 contact hours in the first year and 65 contact hours in the second year. Five topics are identified and the breakdown of the timing is as shown in Table 5.2 The five topics are Health, Organisation, Medicine, Ergonomics and Safety. The distinction between health and medicine is made here because there are courses on more general diseases like infectious diseases for example, and there are courses specific to occupational diseases like occupational deafness for example. In the topic of organisation are included the courses on legislation, structure and functioning of occupational health services and also on institutions concerned with occupational health and safety (e.g. labour inspectorate and social security funds) and their relationship with occupational medicine.

	HEALTH	ORGANISATION	MEDICINE	ERGONOMIC	SAFETY
1st year 100 courses Hrs.	61	19	14	5	1
2nd year 65 courses Hrs.	17	18	11	10	9
TOTAL	78	37	25	15	10
Percentage	47.4	22.4	15.1	9.1	6

Table 5.2 Timing breakdown of occupational medicine syllabus.

It can be seen that safety represents only 6 % of the course over the two years and in reality consists of 2 hours lectures on health and safety generalities in five different activities, petrochemicals, steel, construction, woodworking and forestry. Indeniably the training of industrialphysicians is very much devoted to medicine and health (over 60 %).
Considering that ergnomics and safety are aspects which are essential to the physician's involvement in the workplace, the corresponding training is very limited (15 % of the total course).

The survey of CAILLARD (1982) revealed that all the physicians belonging to the sample studied (130) expressed the need for further training in ergonomics and technology. A similar survey of CANTINEAU (1982) carried in a different region of France than the first, revealed that 70 % of the physicians covered by the survey (172) hoped that the content of the coure will be expanded to include deeper course on ergonomics and technology and suggested that the period of training for

future certificates be extended to three years.

The question of competence is further complicated by the number of undertakings engaged in different activities and therefore presenting different working conditions and associated dangers as will be demonstrated in the following section.

5.2.2. OCCUPATIONAL HEALTH SERVICES

As stated earlier, obligations are laid on all types of activities and professions to have an industrial physician to supervise the health of the employees. The form of the occupational health service is a function of the time that any undertaking can employ a physician and is set out according to a specified rule (Law of 1946). The rule sets out a limit of 173 hrs/month, beyond which an undertaking must establish its own occupational health service. When the time load is between 20 hrs./month and 173 hrs./month there are two alternatives : theemployer may choose to establish his own service or join a group occupational health service, shared between several undertakings. If the load is less than 20 hrs./month the employer must join this last form of health service. These specifications were reproduced in the law of 1979 and Table 53 gives them as stated in the law.

Temps d'emploi du médecin du travail	⩾ 173 h./mois	⩾ 20 h./mois < 173 h./mois	< 20 h./mois
Entreprise à établissement unique	Service autonome d'entreprise	Service autonome d'entreprise ou service interentreprises	Service interentreprises
Entreprise ayant plusieurs établissements :			
— Etablissement d'une entreprise employant globalement un médecin < 20 h./mois.	—	—	Service interentreprises
— Etablissement employant médecin ⩾ 173 h./mois.	Service autonome d'établissement	—	—
— Etablissement employant médecin < 20 h./mois dans entreprise employant globalement médecin ⩾ 20 h./mois (sans limite supérieure à 173 h./mois).	—	—	Service interentreprises ou Service autonome interétablissements d'entreprise
	—	Service autonome d'établissement ou Service autonome interétablissement d'entreprise ou Service interentreprises	
— Etablissement employant médecin ⩾ 20 h./mois et < 173 h./mois (dans toute entreprise sans limite supérieure à 173 h./mois).	—		—

Table 5.3. Different forms of occupational health services as specified by the laws of 1946 and 1979.

There is no official indication as to the origin of these figures but a simple arithmetical computation shows that the figure of 173 hrs./month corresponds to 40 hrs./week ($173 = \frac{40 \times 52}{12}$) which is the work load on full time occupations. The logical question is : how was the physician's working load determined ?

This is specified by the legislation in terms of number of employees and in a very broad sense, as a function of risk they are involved with, namely the working conditions. The rule is as follows (art. R241.32) :

> *"The time allowed for a physician to accomplish his mission is fixed at 1 hrs./month for :*
>
> - *every 20 employees (office work etc...)*
> - *every 15 shopfloor workers*
> - *every 10 workers who are under special medical supervision because of their working conditions".*

In theory the smallest undertakings which are obliged to establish an autonomous occupational health service are those where all the (173 x 10) employees are under special supervision, which is a relatively large undertaking. As in any industrial undertaking there might well be the three categories of employees mentioned above, the average work load would be 1 hr/month for every 15 workers and therefore undertakings concerned with a duty to estabish an autonomous occupational health service are those employing 2 595 employees. However the number of undertakings employing more than 1 500 employees on one worksite or factory in France is only 428 undertakings which represents about 0.03 % of the total mumber of undertakings (Travail et Sécurité 1984). In theory, therefore, there is no reason to expect more than 428 autonomous occupational health services.
In practice, and because of the lower limit of 20 hrs/month, giving free choice to the employer, the situation is somewhat better in terms of the number of autonomous services currently in existence. Table 5.4 and 5.5 give the picture of the situation over the last ten years. It is important to realise, however, that the existence of an autonomous service does not automatically imply occupation of a full time physician. One physician may well work for several undertakings at the same time,

Year	Workers Registered	Autonomous Service	Autonomous (Serveral Plants)	Group Services	TOTAL
1972	9 126 658	2 715		595	3 310
1973	9 730 787	2 719		585	3 304
1974	9 950 364	2 370		576	2 946
1975	10 225 313	2 323		585	2 908
1976	10 609 846	2 352		560	2 912
1977	10 651 543	2 370		563	2 933
1978	11 130 439	2 369		554	2 923
1979	11 394 175	2 299		527	2 826
1981	11 525 780	1 509	161	480	2 150
1982	11 762 970	1 383	269	473	2 125
1983	11 901 029	1 421	199	471	2 091

Table 4 Evolution of Occupational Health Services From 1972 to 1983

Year	No. of Ind. phys. Full - time		No. of Ind. phys. Part - time		TOTAL
1972	1 827	34,75 %	3 430	65,25 %	5 257
1973	1 859	37,88 %	3 048	62,12 %	4 907
1974	1 877	37,22 %	3 166	62,78 %	5 043
1975	1 997	40,63 %	2 918	59,37 %	4 915
1976	2 119	41,00 %	3 084	59,00 %	5 203
1977	2 209	42,00 %	3 039	58,00 %	5 248
1978	2 297	41,57 %	3 229	58,43 %	5 526
1979	2 458	43,20 %	3 231	56,80 %	5 689
1981	2 745	46,99 %	3 097	53,01 %	5 842
1982	2 947	50,04 %	2 942	49,96 %	5 889
1983	3 005	49,60 %	3 054	50,40 %	6 059

Table 5 Evolution of Occupationam medicine Man power from 1972 to 1983

running the autonomous service of each of them.
The predominant situation is that of general practionners holding occupational medicine certificates and practicing both private *(medecine clientele)* and occupational medicine. Although their number tends to decrease over the last ten years, it still remains very high (over half) as shown in Table 5.5.
Table 54 shows a decrease in the number of services from both categories (group and autonomous services), but at the same time it shows an increase in the number of employees registered. There is therefore an increase in the number of employees registered in any one service. There is no doubt that the autonomous services provide advantages to the organisation. Some of these benefits are savings in lost production time, savings through the reduction of sickness absence and possibly increased worker's productivity. But on the other hand the financial return may not always justify the expenditure.

The number of employees per physician is about 3 400, and there are even cases of 4 200 employees per physician (see CANTINEAU 1982). The reduction in the number of occupational health services in general is due to the current financial difficulties, the running expenses of such services being very high (PARRANT 1983 personal communication).
The study of CANTINEAU revealed also that the number of plants that are under the supervision of each physician is very high (50 to 550) which is due mainly to the very high number of undertakings employing less than 50 employees.

In order to demonstrate these difficulties DAVID (1982) described the detailed structure and organisation of one occupational health service. The service is a group service employing 23 physicians and serving 3 500 undertakings. These undertakings are divided according to three geographical sectors. The southern sector, for example, includes 945 undertakings, and 5 physicians are responsible for the whole sector. Their work is organised in the following way :

DAVID described the workload of the first full time physician as follows :

4 undertakings with an autonomous service
86 undertakings employing less than 5 workers
37 undertakings employing between 6 and 25 workers
9 undertakings employing more than 25 workers.

Physicians	No. of Workers registered	No. of undertakings
Full time	2 749	136
Full time	2 520	230
Full time	2 977	202
Part time	1 341	164
Part time	1 122	213
5 physician	10 709	945

He concluded that despite the fact that the number employees to each physician is reasonable according to the existing statutory regulations. The physician's action in the workplace is very limited and he cannot have much effect on the small undertakings because he does not have time to visit them.

5.2.3. TIME

The situation described so far suggested further analysis in terms of time allocation for the physician to be able to deal with all the aspects of health and safety as spelt out in the regulations considering the very high number of plants he is in charge of.

As indicated earlier the memorundum of 1969 suggested that 2/3 of the physician's working time for any undertaking should be devoted to the clinical aspect of his activity and the remaining 1/3 should be spent on the supervision of the workplace. This suggestion became law in 1979.
It is beyond the scope of this work to explore the clinical activity of the industrial physician, though it is interesting to note that yearly medical examinations are compulsory to all employees (art.241.15), but in practice these examinations take place every 15 months because of lack of time and large numbers of people to be examined (PARRANT 1983).

In theory the time that should be devoted to the physician's action in the workplace (known officially as LE TIERS-TEMPS) can be calculated as follows : In an undertaking employing 100 people, the working time of the physician is 6 hrs. 40 minutes per month, i.e. less than one working day a month. The "tiers temps" works out to 4 days a year. Considering that the number of undertakings employing less than 100 workers in France is about 60 % one can see the limited of time that the physician can afford for supervision of the workplace. It gets down to few minutes a month. Having to deal with large numbers of undertakings, physicians themselves reckon that they waste up to ten hours a week in travelling (CAILLARD 1982 and CANTINEAU 1982). It must be mentoned that there is no allowance for travelling time in the regulations.

At this stage of the analysis appears the crucial question of what is the actual activity of the industrial physician on the workplace and to what extent does it satisfy the statutory regulations.

5.3. ACTUAL ACTIVITY OF THE INDUSTRIAL PHYSICIAN

The nature and content of the actual activity of the industrial physician could be determined through analysis of the anual activity reports of a sample of autonomous and group occupational health services, but access to these reports was refused for confidentiality reasons. At the same time a national conference was being organised on this subject of the activity of the industrial physician and it was thought that a careful study of the papers reported at this conference would provide enough information to assess the actual activity of the industiral physician.
The conference took place in Lille (26-29th May 1982) and 27 papers were delivered on this subject. Twenty papers out of twenty seven (73 %) were concerned with workplace case studies. These case studies revealed that they had all taken a lot of time to be finished, some of them took several months (see e.g. GAMOT 1982 and DELPINE 1982). They also revealed that the authors had met major difficulties in the process of investigation and study because of lack of time and through

knowledge of the organisation being studied. The authors admitted that they had to cancel several medical examinations and workplace visits to allow time to concentrate on these studies. Some authors (e.g. PHILBERT 1982) ackgnowledged the need for a close collaboration with the HSS of the undertaking to ease his activity on the workplace. It was admitted that in general this sort of case studies are easier to carry out in undertakings which have their own occupational health service (autonomous) than in undertakings supervised by group services because of the facilities provided on site (the nurse, the investigation equipment and also the close collaboration with the HSS).
The group services had difficulties to carry out these studies because they had to find out cases which would be of interest to a large number of undertakings in order to be able to use the cumulative time of these undertakings on the case study (see POLLET 1982). However the author admitted that, although it may be assumed that a particular problem might be of common interest to a number of undertakings of similar activities there still remains problems related to specific organisation and policy which differ form one undertaking to another and implementation of the solution proved very diffcult. The physician may not impose a sort of "package" solution to all his clients. The problem is further complicated by the fact that the undertakings are grouped in geographical sectors to reduce the travelling time and expences and they are not grouped in terms of specificity of activity. Physicians cannot therefore afford to specialise in one particular type of industry. This situation poses the problem of competence discussed earlier and it was found that some physicians suggested the need for multidisciplinary courses of three years duration (see VERGER 1982).

Another type of problems reported in the papers are related to the workforce education and training. Physicians consider that there is much yet to be done in training of workforce in health and safety and the employers cannot afford the time and expertise to provide this kind of training. This problem of workforce training will be dealt with specifically in the next chapter. However it is important to mention that the industrial physician is frequently drawn in this area, not because of his background training as he has none, but because of his prestige vis à vis the rest of personnel, even the training

manager. He is more likely to inflence and change attitudes (see LABRIFFE 1982). This rises the question of attitudes of the employees towards the industrial physician which will be dealt with in a later section of this chapter.

In terms of depth of analysis and solution process the case studies reported indicated that the physicians had gone through the process from the perception of danger to the choice of specific solutions. However they indicated that the perception was generally through complaints of the workers at the medical examinations and after sick leave. This is an indication of the effectiveness of the legal requirement to subject the worker to a medical examination after sick leave, but it has the major drawback of relying on the worker's state of health to perceive existing danger. No prior investigation was done. In the process of analysis and choice of solution the physician shares expertise with outside bodies like the INRS and private consultants (see BRESSON 1982).

In the survey of CAILLARD (1982), the authors asked 130 physicians to mark the tasks that were more frequently part of his his job on a list of 11 tasks. The marking goes in a decreasing order according to the degree of frequency. Table 5 indicates the results of the study classified according to the type of occupational health service.

Main activities mentioned	Group Sce. 77 physic.	Auto. Sce. 53 physic.
Workplace visits	80 %	75 %
Committee Meetings	79 %	68 %
Ergonomics	60 %	48 %
Personal cotacts with workforce	45 %	44 %
Physician's traig.	19 %	18 %
Training first aid	5 %	12 %

Table 5.6 The percentage indicates the scores of each activity (From CAILLARD et al 1982).

Contrary to the statement of PHILBERT and POLLET above, the indication here is that the form of the service does not affect the activity of the physician as far as the types of activities are concerned, (the

activities are ranked in the same order by both groups of physicians). The workplace visits are ranked first, but the physicians admit that the visits are generally superficial because of lack of competence and time. Some physicians (20 %) stated specifically that incomptetence was the main problem in perceiving the danger on the workplace. Article R241.42 of the law of 1979 imposes a duty on the employer to inform the physician on any modification or introduction of a new technique or product and some physicians go to revealed that management do not obey this requirement.

The study of CAILLARD revealed also that the majority of physicians (75 %) sit on health and safety committees meetings. This fact is also reported by BESSON (1982). He reported 100 % participation.

Ergonomic casestudies are also highly ranked, but in connection with this, the respondents confirmed the statement of POLLET above, in the sense that they admitted that these studies can only be carried out correctly in group studies because of lack of through competence and adequate equipment which they can only find in multidisciplinary groups or in specialised bodies like INRS. These groups are now being established in occupational health group sercies and HSSs from universities are finding jobs within these groups (Three Bordeaux IUT graduates have found jobs in these groups).

The study of CAILLARD reported that less than 5 % of the physsians in autonomous services participated in accident investigations from time to time. Presumably these are physicians working full time in one undertaking, as they get informed by the first aid personnel of their service. Physicians of group services do not have time for this type of activity.

There is also indication that physicians are involved with prevention of accidents via changing of behaviour, but the physicians admitted that this is where there is complete failure as people refused to change their habits even in the basic hygiene principles (see also BRESSON 1982 and LABRIFFE 1982).

5.4. ATTITUDES TOWARDS OCCUPATIONAL MEDICINE

5.4.1. EMPLOYER ATTITUDES

The practice of occupational medicine has been widely criticized in various publications over the last decade. In the recommendations of the SUDREAU report one can find expressions of the need to improve occupational medicine courses and the need to define a new statute for industrial physicians and their activity on the workplace, (SUDREAU 1975, see also FOURNIER 1982). RIGHINI (1976) reported legal proceedings taken by employers against their physicians. Discussions with employers of medium size and small undertakings reveal a rather hostile attitude towards industrial physicians. The following quotation is typical :

> *"My workers undergo yearly medical examinations and when I recruit someone I send him to the industrial physician. Does the physician come to my place ? No, never and I do not see what he will do any way".*

A similar situation was reported by LADOUSSE (1979) and more recently by MONCHE (1982). In his investigation he found that the employers were not satisfied with occupational medicine in general. They questioned the value of medical examinations. Some of them confused the role of the industrial physician and the role of the general practitioner ; they complained that they had to pay large membership fees to occupational health services for tasks that can equally be carried out by general practitioners for much less and for which the worker gets refund from the social security funds. This type of argument was also mentionded in other studies (see BEAULIEU 1982).

Undoubtedly, from the picture that can be made of the industrial physician activity as described so far, evidence from the employees constitutes a valuable source of information.

5.4.2. EMPLOYEE ATTITUDES

There is considerable lack of published evidence on this particular issue of the subject. Informal discussions with many individuals, especially immigrant workers, indicated that they had a very cofused image and the only thing they knew about the industrial physician was

the periodic medical examination and the examination to extend their sick leave. However this sample was too small, difficult to structure, and very specific in nature. The necessity for a more generalised and structured investigation became obvious.

SURVEY : Three hundred questionnaires were randomly distributed to workers in 15 undertakings of different industrial activities and different sizes. The size of the undertaking was the most determinant factor as the physician work load is specified accordingly. The groups of firms are shown in Table 5.7.

Size	No. of Undet. covered	No. of Questionnaires	No. of Resp.	%
1000-1500	2	60	35	58
500-1000	2	60	42	70
250-500	3	60	53	88
50-250	3	60	39	65
10-50	5	60	41	68
TOTAL	15	300	210	70

Table 5.7. Characteristics of the Questionnaire

All the firms were using occupational health group services. Attempts to investigate in undertakings employing full time physicians were refused. The investigation was deemed a direct intrusion in the physician's affairs and against the statutory discretion he possesses. In one of the letters the physician of the undertaking replied in the following way :

> *"...I consider this work as being inquisitorial and trespassing the physician's teritory..."*

However as this type of services is extremely rare (less than 10 %), I condidered there that there was no point in persevering and that the picture gained would not be seriously distorted by the lack of information from such services.
The format of the questionnaire is provided in appendix II, and in essence the respondents were asked to rank in decreasing order what they

believed to be the role of the industrial physician. They had to give an opinion on whether they thought periodical examinations were at all necessary for the detection of occupational diseases, whether they were useful for all diseases or not useful at all.

In terms of the physician's action in the workplace, various discussions suggested that this was difficult to assess as the majority of workers are ignorant of the statutory regulations related to this aspect of the role of the industrial physician. People can only recall occasions where they had direct involvement with the doctor and this situation never hapens in the working place. So a question in terms of how often do you see the physician in the workplace would get the official time as set by management and a question like how often did you have to deal with the physician, would get the answer ; "when I go for medical examination"; the sample being random, it is unlikely to meet cases where the worker had been involved with a very specific ergonomic case study and had to meet the physician several times. The question was therefore limited to whether they wished the physician's involvement in the work-place. A summary of the results is given in Table 5.8.

Image of the role of the Ind. Phys.	%
Prevention of occup. diseases	68
Prevention of all diseases	50
Prevention of accidents	35
Periodic exam. necessary	71
Periodic exam. useful	65
Whish phys. involv. in W/place	60
Action complementary to G.P.	80

Table 58 Perception of the industrial physician by employees.

It was indicated earlier that the legislation specified the physician's working time as a function of the size of the undertaking irrespective of the type of activity. The answers to the questionnaire from all the categories of undertakings were more or less the same. The trend of reply to individual questions from different categories of undertakings was the same as the general trend presented in Table 58 . This fact may indicate that the picture people have of the industrial physician is, to some extent related to the clinical aspect of his work, which

takes place outside the workplace any way. The results show that according to the workers perception of the role of the industrial physician, he deals much more with occupational diseases. One half of the respondents think he deals also with other diseases and about one third think he deals with the prevention of accidents. The wast majority think that periodical examinations are useful and necessary to the detection of occupational diseases and other diseases. This indicates people's awareness of the risk of diseases and medical examinations as a good monitor to rely on. But they nearly all think that this action is only complementary to the practitioner's action and this is mainly because the statutory regulations prohibit to industrial physicians to prescribe medicine. They can only recommend further diagnosis by general practitioners (art. D241.12 of the Code of Labour).

Again the majority would like to see the physician's involvement in the workplace. This concern was also expressed by the national trade unions representatives addressing the national conference of occupational medicine of 1982 (HODEBOURG 1982 and TOULISSE 1982).

5.5. THE NEED FOR IMPROVEMENT

In response to a direct question evaluating the physician's role as it is currently practiced, the majority of the workers (76 % related to the above questionnaire) declared themselves not satisfied and suggested imporvements in three domains classified in a decreasing order as follows :

- *Establish effective and frequent visits to the workplace.*
- *Modify the physician's power and discretion, though he has much discretion in the way he carries out his duty, he can only advice and has no power to impose.*
- *Increase frequency of medical examinations.*

A similar study was undertaken by BEAULIEU (1982). He asked one single question at all levels of hierarchy in six different undertakings affiliated to one occupational health service. The question read like

this :

> *" According to the law of 20th March 1979 on occupational medicine, one third of the physician's working time should be devoted to the action in the work place.*
>
> *In order to study fundamentally the improvement of working conditions (and all other problems) would you please suggest ideas of how to use effectively this third of working time".*

Table 59 shows the domains indicated by every category of personnel interviewed.

	Top management	Personnel management	HSS	Prod. maagement	Line management	Workers	Staff
Accid. Investigation	✓	✓	✓				
Ergonomics	✓	✓	✓	✓	✓		
Working atmosphere	✓		✓	✓	✓		
Change of behaviour	✓	✓	✓	✓	✓		
Change work habits			✓				
Hygiene	✓		✓				
Rhythm Study			✓			✓	
Improve W/ conditions	✓		✓			✓	
Establish link I.P/GP.	✓		✓				✓

Table 5,9 Domains of improvement as suggested by the respondents (From Beaulieu 1982)

this :

> *" According to the law of 20th March 1979 on occupational medicine, one third of the physician's working time should be devoted to the action in the work place.*
>
> *In order to study fundamentally the improvement of working conditions (and all other problems) would you please suggest ideas of how to use effectively this third of working time".*

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Working atmosphere	✓		✓	✓	✓		
Change of behaviour	✓	✓	✓	✓	✓		
Change work habits			✓				
Hygiene	✓		✓				
Rhythm Study			✓			✓	
Improve W/ conditions	✓		✓			✓	
Establish link I.P/GP.	✓		✓				✓

Table 5,9 Domains of improvement as suggested by the respondents (From Beaulieu 1982)

The author reported that all the respondents at all the levels of hierarchy were concerned about the study of work posts in terms of ergonomics.
Top management and first line management wish to reduce the number of accidents and occupational diseases. They express concern about the physician's involvement with accident investigation, attitue change and safety campaigns.
The health and safety technicians express the wish for the physician to get involved in all the activities listed on the table. This is an interesting indication which will be dealth with in lated later sections of the thesis. It suggests the sesire for close collaboration and acceptance of a share of the domain of expertise.
Production line management express the nee for further studies in adjusting the production techniques and rates to the psychological and physiological capactity of the workers.

There is one further factor which will need improvement of the role of the industrial physician in the workplace. This is related to his status within the new health and safety committee, as established by the of 23rd December 1982. The details of this question will be given in the subsequent chapter. But in connection with the role of the physician it must be realised that the role of the physician will have to change because of the change of his status within the committee. The physician is no longer a full member of the committee and therefore he cannot wote within the committee. But he must attend all the committee meetings as a technical expert. He must therefore realise that his influence on the committee will no longer depend on his status as full member but will depend mainly on the nature and quality of technical expertise he may have to offer in these occasions. This in turn depends on his knowledge of the undertaking and the workplace.
The new law extends the scope of worker's participation in health and safety. They will seek advice from the physician. It extends the committee's power in the sense that the committee may call any external expert to carryout investigations related any particular problem related to health and safety. The physician may therefore have to face some sort of chalenge in his domain of action. This concern is now being

expressed by some physicians (Parrant 1983).

Returning to the input-output model, the analysis carried out so far has demonstrated that the role of the industrial physician is very limited with regard to the role assigned by the legislation. The study revealed that a number of surveys carried out by physicians themselves had shown that thye were far from stisfying the spirit of the legislation. In actual practice the only legal requirement which could be satisfied is the periodic medical examinations and also the examinations to certify fitness of new recruits or people returning to work after 21 days sick leave.
The main activity of the industrial physician is therefore concentrared on clinical aspects of medical examinations. His contribution to in-plant safety and health can only be through these examinations and whatever the workers report on their work stations.

CHAPTER 6

THE ROLE OF THE HEALTH AND SAFETY COMMITTEES

The provisions for workers involvement in occupational health and safety are now nearly forty years old. The legal basis is the Decree of 1st. August 1947. This Decree established the health and safety committee, defined its role, its method of working and the power and discretion given to the members of the committee. Subsequent Decrees (1st. April 1974 and 20th. March 1979) are reminders which insist on consultations with employers to promote the development of arrangements for health and safety at work.

A more recent law (23rd. December 1982) has changed the health and safety committee (HSC) to the Health, Safety and Working Conditions Committee, (HSWCC). This law changed the form of the committee and extended its domain of activity.
In this chapter the description of both committees will be given together with an analysis of the role of the committee in terms of its contribution to the prevention of accidents and occupational diseases. The method of analysis will be the same as in the preceding chapters.

6.1. THE HEALTH AND SAFETY COMMITTEE (HSC)

The law of 1947 provided for the establishment of an HSC in every industrial organisation with at least 50 workers and in other organisations (agriculture, transport, etc...) with at least 300 employees.

It is a joint Labour/Management Committee of up to 15 members, some full time and some two year mandate members. The full time members must be chosen for their competence in terms of expert knowledge in the field of occupational health and safety.

The full members are :

- The employer or his representative, who is the chairman of the committee.
- The training manager, when there is one in the organisation.
- The industrial physician.
- One person from management designated by the employer to act as the permanent secretary of the committee. He is generally the health and safety engineer or animator, when there is one in the organisation.
- The ingenieur conseil or controleur of the C R A M, may sit on the committee meetings if he wishes.
- The inspector of labour may also sit on the committee meeting if he wishes.

The two year mandate members are either 3, 6 or 9 workers representatives depending on whether the size of the organisation is in the range of 50 to 500, 501 to 1 500 or above 1 500 workers respectively. The workers representatives are elected by the whole workforce in the undertaking. However the Law of 1947 and the subsequent texts recommend strongly that the choice of eligible candidates be based on their competence and knowledge in the field of occupational health and safety. The guidance note of the Ministry of Labour (Circ. 8/8/74) for example says : *"The criteria of competence and efficiency are of prime importance"*. Although this recommendation has no statutory power as the choice remains very subjective and there is no established examination, it nevertheless shows that the spirit and the intention of

law are to provide members with the required competence and knowledge capable of handling the problems related to occupational health and safety within the organisation.

According to the Law, the HSC is therefore established as a "technical institution" in the organisation, which means that the workers representatives should carry out their duties without any trade union intrusion. In theory it is rgarded as such, (see GAUDMET 1978), but in practice their activity is very much dominated by trade unions claims as will be shown later.

6.1.1. DUTIES OF THE HSC

These duties are described in section R231.5 of the Code of Labour. All the subsections are listed in Table 6.I together with other sections relevant to the power and discretion of the committee. The analysis remains the same as in the previous chapters and it is carried out with reference to the elements of the model. For example subsection R231.5.1 states : *"The committee analyses all occupational dangers to which workers are exposed"*. It would be classified under elements A and B of the model to cover all aspects of danger and it will also appear under element D wich refers to analysis.

Section of case of Labour:	A			B		C	D	E	F	G	H
R 23151	✓	✓	✓				✓				✓
R 23152	✓	✓	✓				✓	✓		✓	✓
R 23153	✓	✓	✓	✓	✓	✓				✓	✓
R 23154	✓	✓	✓	✓	✓			✓	✓	✓	
R 23155	✓	✓	✓	✓	✓	✓					
R 23156			✓						✓	✓	
R 23157	✓		✓						✓	✓	
R 2316	✓	✓	✓	✓		✓					✓
R 2317	✓	✓	✓	✓	✓	✓	✓				✓
R 2318	✓	✓	✓	✓	✓		✓				

Table 6.I The duties of the HSC as designed by the legislation with reference to input output model.

The table shows that the statutory provisions cover all the elements of the model. This is reinforced by the guidance note of the Ministry of Labour refring to section R231.5 of the code of labour which explains that the duties of the HSC should cover all the aspects of occupational health and safety.

There is no doubt that the law requires the HSC involvement in all the elements of the model, although it does not indicate the depth of invovement except to say that the committee is required to draw conclusions from the analysis and suggest solutions, (see Art. R231.5.2.). The committee has complete discretion in the way its duties are carried out and this is also shown on the table against the relevant sections.
The dismissal of a member of the committee (Worker s'representative) must be subject to the agreement of both the Management Workers Committee and the inspector of labour (see Art L 436.1.).
The meetings of the committee are established on a quarterly basis, the date of each meeting being decided by the president. Extraordinary meetings may be held in the case of a severe accident or near accident but the implementation of this duty is difficult as it rises the question of severity and nearness of the accident. There is evidence that the employer and the workers representatives always hold different views on these issues and in practice this type of meetings takes place in cases of major accidents only (CHASSINE A 1982, SEILLAN 1976).
The president of the committee and the secretary must define the agenda of the meeting at least two weeks in advance ; the workers representatives, the inspector of labour, the ingenieur conseil of the C R A M and the industrial physician are notified of the meeting.

According to the law the agenda must include the analysis of all the types of danger at the work place, the examination of past accident enquiries, and whatever every member of the committee (workers representatives) has to report to the committee about his inspection tours during the last three months (see Art. R231.8).
The committee should be involved in the choice of solution and very much in the implementation of these solutions since it is required to take all initiatives in order to pormote the prevention of accidents

and occupational diseases (see Art. R231.5.4). Furthermore the employer has the duty to consult the committee on every arrangement related to safety and health ; SEILLAN (1982) reported numerous cases of employers charged with heavy penalties for failing in this duty. There is no doubt that this is a very serious obligation , but it nevertheless suggests that the members of the committee must be knowledgeable in the field in order to be able to give advice when they are consulted. The question of training will be considered in a later section of the chapter.

6.1.2. THE ACTUAL ROLE OF THE HSC

PETERSON (1978) writes :

> *"At best, committees provide training and motivation for their members, at worst they are a total waste of time".*

ENGLISH (1979) reckons that safety committees, especially the joint Labour/management type, have a bad reputation and a poor record of accomplishment. He gives two reasons :

- *Lazy management that is put under pressure from the insurance carrier or government to "do something" about safety may appoint a safety committee to show some activity but may have no intention of expending any management energy on the accident problem.*
- *Ignorant management sometimes sets up committees to do management's job in safety.*

The author states that such an abdication of responsibility is not only an unproductive use of the time and talent of the committee members, but has the negative effect of demonstrating that the boss does not have time for safety.

ATHERLEY et al (1975) suggested three possible forms of workers involvement in occupational health and safety in Britain, namely inspection, consultation and participation. However the authors concluded that they did not see the role of the workers representatives as a substitute for the employment by industry of health and safety specialists.

BOOTH and GLENDON (1982) bringing up to date the study of ATHERLEY considered that most of the points raised by ATHERLEY were substantiated by developments in the intervening years. However they too, admit that the effectiveness of committees in improving occupational health and safety remains to be proved.

The foregoing remarks concern practices in the United States and United Kingdom. In these countries the legal requirement for HSCs is either non existant (USA) or very recent (UK). The French legislation on this issue is now nearly 40 years old. Despite that, the statisics of the Ministry of Labour show that the number of established HSCs has never reached the statutory requirement presented earlier. The fiures in table 6.2 indicate the trend of the HSCs established in undertakings subject to the law.

Year	Percentage of Undert. Having an HSC.
1950	64 % of liable Undertakings.
1966	56 % " " "
1972	60 % " " "
1982	75 % " " "

Table 6.2 Evolution of Establihed HSCs.
(Extracted from Ministry of Labour Report 1982)

The figures indicate that there is still a considerable lack of compliance in the establishment of this Committee. A fact which reinforces the argument on the labour inspector's involvement in enforcing the establishment of the committees as discussed in chapter 3.

The evidence on the functioning of committees in France is very limited and largely anecdotal. Within the established HSCs there is indication that the scope and breadth of the job assigned to the committee by the legislation are far beyond its capacity. This is demonstrated by the study of BETTIGNIES (1976) in the textile, chemical, and steel industries. In his interpretation of the law he distinguishes two domaines of action assigned to the HSC, namely :

- *what he calls the "action on the production process" in which he includes maintenance, equipment damage, adjustment of apparatus, layout of the workplace, coordination of activities, pace of working, work layout, material handling, and personal protection.*

- *"action on the conditions of work" in which he includes ventilation, temperature, noice, light, cleanness, breaks, rest rooms, hygiene, drinks, infirmary, first aid and fire drills.*

BETTIGNIES explains that this interpretation of the law may go as far as to cover all aspects of occupational health and safety and working conditions.
Regarding the type of action that the HSC is required to take, BETTIGNIES considers that there are four types :

- *Monitoring of worker's behaviour*
- *Monitoring of the physical working conditions*
- *Monitoring of the work layout*
- *Participation in training and information*

This obviously covers very little of the elements of the model. The author looked at the effectiveness of the role of the HSC, through observation and interviews in the industries mentioned previously. He did not quote the number of undertakings visited nor the number of people interviewed, but gave the following concluding remarks :

"- *In accident investigation the HSC deals with apparent causes and does not go beyond to seek for underlying reasons.*

- *The ingenieurs conseils of the C R A M and the inspectors of labour rely on the HSC in their inspections and visits. This distroys the image of the workers representatives in the eyes of management and creates obstacles in communication between labour and management".*

The latter remark has been reported by other authors, (see SZEKELY et al 1979 for example).

A chief inspector of labour (VETTERHOEFFEN 1977), when asked his opinion on the efficiency of the HSC in the prevention of accidents and occupational diseases throughout his thirty years experience replied :

" - *There are many HSCs to be established yet and of the 60 % that exist ;*
- *there are those that only exist on paper,*
- *there are those that only do paper work,*
- *there are those that always forget to meet,*
- *there are those where noting happens,*
- *there are those that forget to speek about safety,*
- *there are those that rely on one single man, the health and safety engineer or animator (the secretary of the Committee.)*"

The author gives three reasons for this situation, they are :

- *lack of competence of the members of the HSCs,*
- *breadth of the domain of action assigned to them,*
- *being a joint labour/management committee there have always been two categories of people sitting on the committee.*

The two categories have different backgrounds and different objectives. They hold different views, thus the workers representatives do not feel that their contribution are seriously considered.

Because of the scanty nature of the evidence on the effectiveness of the committee, I decided to conduct a small survey of my own based upon the reports of their meetings. Fifty reports from textile, chemical and steel industries employing from 100 to 1 500 workers were analysed. These industries were chosen to keep within the same categories as in chapter 1. The undertakings were in the following categories :

	100-500	501-1 000	1 001- 1 500
Textile	2	5	7
Chemical	6	9	5
Steel	4	7	5

The reports were provided by the inspection of labour, regional office, and concerned the three years period prior to the introduction of the new law (23 Decembre 1982). The analysis was carried out with reference to the elements of the model so that a comparison between the

assigned job and the actual job could be drawn. Thus a point in the report reading : *"We have noticed a defective guard on press N°6 in the workshop A"* would be classified under perception of danger. It will be shown also under energy as that is the mode of danger on power presses according to the definition of the elements of the model. A recommendation in the report which reads :*"repair, replace, maintain such a device or equipment"* will be classified under monitoring and also under one of the modes of danger depending on whether the deterioration of the equipment will create an energy danger or a chemical danger. It will also be shown under the wearout column.
The quantitave findings of the analysis are shown in table63.

A			B		C	D	E	F	G
Energy	Chemical	Organisation	Innoyat.	Wearout	Perception	Analysis	Choise of Solutions	Implement	Monitoring
120	15	91	20	206	66	20	12	0	128
53%	7%	40%	9%	91%	29%	9%	5%	0	57%

Table63 Analysis of 50 HSC reports with reference to elements of the model.

In the 226 recommendations included in the 50 reports 53 % concerned dangers on apparatus and machinery, 40 % concerned the organisation, worklayout, material handling, stacking, safety rules and warning signs. Only 7 % were related to chemical dangers ; they were all complaints from individual workers to their representatives on the workplace atmosphere which were raised in the committee meetings. It appears

that the committee concentrated on the more easily necognisable aspects of hardware (53 %) and work layout (40 %) at the expense of the less tangible chemical dangers (7 %).

In terms of the nature of the action, the table shows that in the largest proportion (57 %) of the cases it was a monitoring process whereby the maintenace department or the layout department were notified to replace the defective equipment. It would appear that the main activity therefore is to monitor the existing health and safety arrangements. Only 29 % of the contents of the minutes related to perception of danger. Though there is nothing to stop them perceiving danger at other times. Discussions with the HSSs indicated that this exercise takes place seriously the week before the meeting.

The reports did not indicate much participation in the choice of solution (5 %). Some participation is indicated in accident investigations (9 %) but in this respect their effort only goes towards collection of information for the analysis.
The committees were consulted about arrangements for safety and health but they seemed to be more involved in arrangements concerned with safety rules, which are aimed at controlling behaviour rather than altering the physical environment. This is the only area where the committees make innovative suggestions in terms of safety rules (9 %).

This situation leads to considering the type and nature of the training that the members of the committee have received to carry out the duties expected of them. The full time members have already been covered in the previous chapters and this section is concerned with the members of the committee from the workforce.

6.1.3. TRAINING OF THE WORKERS REPRESENTATIVES

The texts of the legislation state or imply the need for members of the committee to be knowledgeable in recognizing and preventing occupational health and safety dangers.
Until the change of the HSC to HSWCC, there was no legal requirement

for training of workers as members of the HSC. The only provision for workers training was the general requirement for the employer to provide information and instruction on physical and health dangers to the worker. This provision is stipulated in section L231.3.1. of the Code of Labour in the following way : *"The head of every establishment shall be required to organise appropriate practical safety training for any workers he recruits, any workers changing their work stations or processes, any workers whom he uses in cases covered by clauses (a) through (e) of section L124.2 of the code of labour (these clauses relate to various categories of part time and temporary workers) and any workers resuming their activity after having stoppet it for at least 21 days".*

BOULIN (1979) reported that the objective of this training is to provide the worker with instruction related to the precautions that he should take to ensure his own safety and that of other individuals employed in the undertaking. He added that the necessary information, education and instruction that were given to the worker concern generally the following aspects :

- *training for the task to be carried out,*
- *the conditions of movement throughout the premises,*
- *the actions to be taken by the worker in the event of any accident.*

If the training is designed to fulfil these objectives, it is directed towards the worker's behavior to ensure his own protection. Though as some believe (COHEN 1979), this is a fundamental method for effecting individual protection against workplace hazards, it is not a training that will provide the competence necessary for the workers representatives of the HSC to carry out the duties assigned to them by the legislation, which are much more global.

In practice the content of the general workforce training has gone somewhat beyond these objectives, but it is still far below the implied knowledge and competence needed by the HSC members, as will be shown by the examination of the following provisions :

TRAINING FACILITIES :

In addition to training on the job which takes place in the undertaking through instruction by the foreman, there are three organisations which are particularly important in worker's training :

6.1.3.1. L'ORGANISME PROFESSIONNEL DE PREVENTION DU BATIMENT ET DES TRAVAUX PUBLICS (OPPBTP), (The Professional Body for Prevention in Construction and Public Works) was created by the Ministry of Labour in 1947, to take the lead in working with HSCs in the construction industry and in the public works area. All enterprises engaged in these activity are required to be affiliated to the OPPBTP. This body is funded by an employer payroll tax of 0,12 % per year. It has a national office in PARIS and 18 regional offices from which its staff advices health and safety committees, and one principal training centre. The annual activity reports of the OPPBTP indicate that their staff make approximately 100.000 visits to construction sites each year, and about 70.000 students, apprentices and teachers, and also 1.800 skilled workers are reached every year by the training activities of the centre.

The centre runs 160 training courses of various types, all of five days, every year. The training courses cover 30 different aspects of the activity of construction and public works. The training of HSC members is but one type and consists of 5 (3 %) courses throughout the year. The remaining 97 % of the courses are skill courses in specific areas of the trade. Each course can only take in 15 people at one time and therefore only 75 people can attend the health and safety training each year. Examination of the training program for the year 1984 shows that only 10 % of the syllabus is concerned with perception, analysis, and investigation of dangers and accidents. The remaining 90 % is concerned with the statutory provisions, and the study of different insitutions concerned with health and safety.

A course set up in this way seems to serve a different objective than effective prevention of accidents and occupational diseases. It suggests a body which liaises between all the various institutions.

6.1.3.2. AGENCE DE FORMATION PROFESSIONNELLE DES AULTES (AFPA), (The Professional Training Agency for Adults) : The agency is financed by the state and is under the control of the Ministry of Labour. Its aim is to train adult workers for jobs as skilled workers or technicians. The training courses include limited mention of safety and health. Every year, some 85 000 trainees with varied backgrounds attend the AFPA centre where they receive training appropriate to their aptitudes. Most are either seeking employment or are workers who have decided to leave their jobs in order to obtain a thorough grounding for a particular trade. There are also people, who while actually working, whish to follow courses for a specific purpose.

6.1.3.3. INSTITUT NATIONAL DE RECHERCHE ET DE SECURITE (INRS) : The description of this insitute has been given in the chapter on social security. Training is one of the aims of the insitute and courses are offered free of charge for the benefit of workers and particularly members of the HSCs. These courses include :

- *Training courses to enable instructors at the workplace to teach proper postures and handling methods aimed at reducing fatigue and preventing accidents.*
- *Training courses for occupational first aid instructors.*
- *Training courses for members of the HSCs.*

In general, the courses for members of the HSCs are of two weeks duration (64 hours). However the details of the sullabus show that only 8 hours (12.5 %) are concerned with perception and analysis of dangers through the study of past accidents. The rest of the course is again devoted to aspects of legislation and management.

6.1.4. DISCUSSION

The present review reveals that the contribution of the worker s committees is limited mainly by the background training of the members. Indeed, as currently run all the courses described so far, do not provide a stisfactory level of health and safety knowledge, although

there is a clear potential for them to make a significant contribution, given the throughput if the content was seriously considered. Other obstacles to the training of the worforce are linked with the attitudes of the workers themselves.

The law specifies that worker training should take place in paid working time. The study of DEZANDRE (1981) reported 40 interviews with employers, and indicated that all of them were in favour of the training and are willing to provide the necessary facilities. A typical attitude may be examplified by the following statement :

> *"I know of no responsible individual who would think of committing his employees to a work situation without their being properly trained (and this includes knowledge of the actual and potential hazards of the work tasks that they will be called upon to perform) and without first assuring himself that they know the risks, if any, involved and what to do about them".*

On the other hand, the author reported that the employers declared that the workers were very reluctant to attend any training if it did not lead to any promotion. For this reason trainings related to production wererelatively more accepted by the employees than those related to safety and hygiene. The study concluded that according to the employers, there is a complete lack of motivation and interest on the part of the workers which is the major obstacle to worker's training.

Despite the discretion and power that the committees have been given in carrying out their duties as was described earlier, it appears that the ones studied had not used their power in the implementation of the solutions. The committee is by law a consultant institution and as such it can give advice but it cannot enforce the implementation. The final decision of the committee remains with its president (the employer or his representative). The committees studied did not show any initiative to overcome this institutional obstacle.

Thus far, my argument has been to estalish the gap between the duties of the HSC and its actual role. It may seem surprising considering

that gap, that some authors argue that the lack of participation, motivation, and interest in the prevention of accident is mainly due to the narrow technical field of occupational health and safety (DENEVE 1976, SEILLAN 1983). This point is discussed further at the end of the chapter, as this is the sort of arguments which led to the recent change of the form of the committee.

6.2. THE HEALTH SAFETY AND WORKING CONDITIONS COMMITTEE (HSWCC)

A number of modifications were introduced in the legislation of labour during the year 1982 ; they concerned the period of work, temporary work, work contract, worker s right of expression, workers representatives, and collective bargaining. Among these, the AUROUX Laws (then Minister of Labour) were designed to bring in major changes in the industrial relations within the undertaking. Indeed, AUROUX wrote in his preparatory report to the President :

> "The workers must become citisens in the undertakings, they must be the actors of change in these undertakings" (see SEILLAN 1983).

Mr. AUROUX wrote also :

> *"Whilst there is no question of intervening in management and decision making in the undertakings, it is advisable to establish mechanisms which make possible the expression of all the energies and capacities. The workers in the interprise consittute a potential of competence, innovation, and talent which are frequntly misused".*

The law of 23rd. December 1982, is the fourth law of AUROUX and is concerned with the HSWCC. Under this law a new form is given to the committee, its constitution is changed and its domain of action is extended.

The last code of practice related to this law has just been introduced (Decree of 2nd. Nov. 1984), thus there is no literature on the HSWCC nor is there any empirical data and therefore what is said below can only be speculative where it concerns the effect of the law on the committees action.

6.2.1 THE CONSTITUTION OF THE COMMITTEE

Unlike the HSC (a joint Labour/management committee), the HSWCC is essentially a worker s representatives committee, but the law maintains the employer as president of the committee. The number of members of the committee has been specified by the Decree of 23rd. Sept. 1983 and its provisions are shown in table 64.

Size of Undert.	Shop floor Work. Reps.	Staff Reps.	Total
50-199	2	1	3
200-499	3	1	4
500-1 499	4	2	6
1 500-+++	6	3	9

Table 64 Constitution of the HSWCC.

Among the employees representatives there are some from the shop floor and some from staff. They are to be elected by the workers and staff respectively. The mechanism of the election raises a number of questions especially in organisations where there are many workers representatives Unions, each of them wishing to be represented in the committee. There is already considerable disagreement on this point, while the legislation does not give a precise solution and leaves the issue open to agreement between the Unions (see SEILLAN 1983). The new law recommends the choice of the eligible persons according to their competence and knowledge in the field of occupational safety and health, but again it is expressed in the form of a recommendation without much statutory power. It does however provide for specific training as will be described later. The committee members mandate is maintained as two years duration, but the status of full time members has been completely abandoned. The industrial physician, inspector of labour, and ingenieur conseil or controleur of the C R A M may sit in on the committee meetings, but only to be consulted and not to vote as in the previous constitution of the HSC. The safety engineer or technician may also sit on the committee meetings but he

is no longer the secretary of the committee unless he is elected as as worker or staff representative.
Other "competent persons" from the organisation and experts from outside the organisation may be asked to participate as consultants in the committee meetings; the workers representatives decide on this.
The committee meetings are retained on a quarterly basis, with possibilities for extraordinary meetings and again the workers representatives decide on the degree of severity of the hazard which justifies this. There is therefore a shift of power to the workers representatives who will obviously need considerable training in order to be able to bear those responsibilities.

6.2.2. THE DUTIES OF THE HSWCC

The HSWCC now has the duties of two committees, the duties of the HSC which have been discussed earlier and the duties of the committee for improvement of the working conditions (CIWC) established by the law of 27th. December 1973. The duties of the CIWC are stated in the Code of Labour, section L437.1. They include such aspects as the length of the working day, working hours, night work, physical working environment, and work organisation. This section states also that the CIWC is consulted on every arrangement related to health and safety. This indicates that there was an overlap in the duties of the HSC and the CIWC and in practice this overlap has caused considerable probems (see TEYSSIE 1983 and SEILLAN 1983). Both these authors report that the CIWC were practically non eistent except on paper and were not efficient in their role.

In the explicit hope of obtaining more efficiency in the promotion of occupational health and safety, the new Law amalgamated the HSC and the CIWC.

6.2.3. THE MEANS OF ACTION

The new law has four provisions to assist the members of the HSWCC to carry out their duties namely :

6.2.3.1. TRAINING : The new Law states, *"In establishments employing 300 workers or more, workers representatives in the HSWCC shall have the necessary training to carry out their duties... The cost of financing such training shall be borne by the employer.*

In establishments of less than 300 workers, this training and its cost shall enter into the collective agreement..."

A five day training course is required for every member of the HSWCC, each of whom has to attend such course in a training centre of his choice, provided that this centre is apporved by the Ministry of Labour. The characteristics of the training centres together with the objectives of the training course have recently been specified by the Decree of 2nd. November 1984.

According to the law the members of the HSWCC should be able to detect, analyse and measure dangers related to occupational health, safety and working conditions. The training syllabus should be specific to the branch of activity with which the committee is particularly concerned and should include therory and practice, (see SEILLAN 1984).
The training centres officially approved to deliver the course are the Trade Unions Training Centres and the University Departments of Labour*. Others, such as the OPPBTP may apply for permission which is delivered by the Authority of the area (le Commissaire de la Republique de la Region) subject to satisfaction of the requirements in terms of competence of personnel in charge of the training course. It is surprising that the Departments of Safety and Hygiene of the I.U.T are not included in the officially approved list and are also subject to permission.

6.2.3.2. TIME : Unlike the old provisions where it is stated vaguely in section R231.8 that the time spent on the meetings and on the duties of the HSC shall be considered as working time, the new law specifies the time allowed to every workers representative in order to carry out his duties as a member of the HSWCC. The time spent on the committee meetings and on the accident investigations shall not be included in this time

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* department of Labour : direct translation of "Institut du Travail", a university department teaching graduate courses in Law of Labour.

allowance and cannot be deducted from it (section L236.7). The time allowance is a function of the number of workers in the establishment and is defined as shown in table65.

Nb. of Workers in the Undertak.	Nb. of Hrs/Month. per Representative.
50- 99	2
100- 299	5
300- 499	10
500-1 500	15
1 500-and more	20

Table65 Time Allowance For Workers Representatives.

The new law points out that this allowance is a minimum and may be exceeded in exceptional circumstances. This refers back to the old law where no limit was specified. However as SEILLAN (1983) reported, the lack of specification of time limit in the old provisions created numerous conflicts ; the employers claimed that the workers representatives committed abuses in the use of time allowance and the workers representatives claimed that they never had enough time to carry out their duties. Indeed even within the time limit allowed, there is still no way of justifying an effective use of time as there is no provision that will fix accountability for results.

The new law provides also that the total time allowed to members of a HSWCC may be used by one individual member with regard to his competence and knowledge in the field of occupational health and safety or to solve a particular problem in the field. This situation may take place each month and the member must be designated and the employer must be notified in advance.
If this provision is to be put in to practice, one may find cases where one individual workers representative spends three weeks per month on occupational health and safety in organisations employing 500 to 1 499

workers and it may exceed one month in organisations of more than 1 500 workers, (see table 65). It is possible to conceive that the committee may decide to train and appoint one of its members as health and safety specialist. Only the future will tell what the practice will be.

6.2.3.3. POWERS : The provisions of the old law related to the HSC members have been maintained for the members of the HSWCC (see sections L436.1 to L436.3).

6.2.3.4. WITHDRAWAL FORM A DANGEROUS SITUATION : The new law provides for any worker to withdraw from a situation which he reckons present, an imminent danger to health and safety. The worker must ensure, however, that his withdrawal does not create a new danger to his colleagues. This again implies thorough knowledge and competence in the perception and analysis of danger. The perception of danger is a complex process as discussed earlier and therefore this provision will certainly be difficult to put into practice. So far no such cases have been reported in literature.

SEILLAN (1983) described various hypothetical cases in which he demonstrated the responsibility and burden of proof from the legal point of view. The study is very extensive and is complicated by the various issues of the legislation. In summary there are two main issues depending on whether or not a HSWCC exists in the undertaking

- *The worker decides to withdraw from a situation he thinks dangerous for his safety or health. There is no intervention of a workers representative or from the HSWCC ; the employer may oblige the worker to resume work. If the latter refuses he may be penalised, according to article L231.8. Divergence over the actual existence of the danger is not provided for in the law. The worker may take legal action. Only the inspector of labour or the ingenieur conseil of the C R A M have the power to stop the employer from penalising the worker withdrawing from what he thinks is a dangerous situation, (Art. 122.40). However the article specifies that the use of this power is subject to a clear demonstration of the actual existence of danger, by the inspector of labour or the ingenieur conseil. The competence and power of these people have already been discussed and only the futur will tell the extent to which the present provision will be used with efficiency.*

- *When the HSWCC exists in the undertaking, the worker shall inform his representative of the situation. An analysis of the situation shall be carried out, the inspector of labour and the ingenieur conseil of the C R A M must both be informed and a decision must be taken by the HSWCC. The law provides also for external expertise if deemed necessary by the committee. Again this is a provision which requires the competence and training of all members of the HSWCC including the inspector of labour and the ingenieur conseil of the C R A M.*

6.2.4. THE FUTURE OF THE HSWCC

This committee is still in its infancy, therefore its contribution to the promotion of the prevention of accidents and occupational diseases cannot be judged objectively.
However some remarks can already be made by considering the change that will actually take place in undertakings in comparison with the previous committee.
Table 5.6 shows ananalysis of four papers delivered at a conference in Bordeaux, on the changes that the new law will introduce with regard to the existing HSC in the undertaking. The papers reported on the current situation and what the organisation envisaged doing to fulfil the new requirements (Compterendu du colloque Aquitain 1983).
The element of the analysis presented in the papers were the constitution of the committee, its meetings, inspections, domain of activity, training, time allowance, and perception of imminent danger.

It can be seen that despite the fact that the legislation has changed the character of the committee from one which was mainly technical, with full members chosen because of their competence, to one which is purely a workers representatives committee, the four organisations envisage practically no change in practice.

The number of workers representatives is maintained because it satisfies the requirement. Some change will take place in the secretary of the committee, but not a great deal in practice. In enterprise A, for example, the secretary of the HSWCC will remain the health and safety engineer as he will first be selected as one member of staff in the committee and

	A 1 500 workers	B 1000 workers	C 100 workers	D 380 workers
Nb. of HSC Members	3FM + 6WR	4FM + 6WR	7FM + 5WR	4FM + 3WR
Nb. of HSWCC Members	No change The HS specialist is elected in the 6WR	No change	No change	No change
HSC meetings HSWCC	4 no change	4 no change	4 no change	4 no change
Nb. of Inspections	4	4	4	4
Domaine of Activity	Same as HSC	Same asHSC	Same asHSC	Same HSC
Training of HSC Members	NONE	Internal Traig.	NONE	One week INRS
Training of HSWCC Members	To be specified	To be specified	To be specified	To be specified
Time of HSC	Depends on supers or	12 hts	Depends on supers or	Depends on supers or
Time for HSWCC	15	15	15	10
Perception of Imminent danger	very rarely source of conflicts	very rarely source of conflicts difficlut to perceive	Never source of conflicts	Never source of conflicts

Table 56 Change of HSC to HSWCC (Analysis of 4 Undertaking Practices compiled from Papers delivered at Bordeaux Conference 1983.)

the members of the committee will elect him as secretary due to his competence and past experience. In enterprise B the author declared that the secretary's work will be prepared by the H&S engineer and it will only be written formally by the secretary of the committee. In all the enterprises, the authors declared that they were not in favour of a radical change of the constitution of the committee as this would weaken the motivation of the previous full time members of the committee who are the most competent in the field as discussed earlier.
The law does not prohibit the presence of these experts in the committee and leaves the possibility to the committee to invite them to sit on the meetings.
The new law does not alter the frequency of the meetings and in the opinion of the authors those will be maintained on a quarterly basis, the inspections being carried out at a rate of one inspection prior to every meeting.

Only one enterprise (B) had the practice of allowing 12hrs. a month for every representative to carry out his HSC duties, but no indication was given as to the use of this time. The remaining three enterprises indicated that this time depended on the supervisor and the justification that the representative shows to use this time. In practice time is certainly allowed only for organised inspections and committee meetings.
The four authors were somewhat concerned about the right to withdraw from imminent danger and could not see that this provision would be put into practice without much conflicts. In addition they believed that perception of danger is an extremely difficult process.
Further evidence on this issue comes from a meeting organised by the department of safety and hygiene of Bordeaux between the Chief inspector of labour of the Regional Office Bordeaux, the Ingenieur Conseil en Chef of the C R A M Bordeaux, and three Trade Unions representatives (CFDT, CFTC, FO). The object of the meeting was to discuss the evolution of the HSWCC since the introduction of the law. The debat was tape recorded, and the main points relevant to this study are surmmarised below.

- All the participants admitted that it was too early to carry out a conclusive assessment on the role of the HSWCC ; indeed some of the provisions of the law have only just been specified by Decrees (for example the Decree of 2nd. Nov. 1984 mentioned earlier).

- Both the inspector of labour and the ingenieur conseil of the C R A M declared that their respective effort is currently being put into the monitoring of the establishment of committees in undertakings previously not liable under the provisions of the old law. The inspector of labour said that at present only 40 % of the undertakings covered by the new law have actually established a HSWCC. However he added that this figure only shows that these undertakings satisfy the requirements of the law but does not guarantee the good functioning of the committee, and there is still a considerable effort to be made to satisfy the spirit of the law. He concluded that the HSWCC, has formally well started although a number of difficulties are still to be solved.

- The ingenieur conseil of the C R A M agreed with the point of view of the inspector of labour. He further regarded the role of the HSWCC as a substitute for the role of the controleurs of the C R A Ms in in-plant safety and health. He was more in favour of the intervention of the workers from within the enterprise rather than an intervention from bodies outside the organisation. To some extent this line of reasoning is true, but the experience of the old HSC described previously does not promise well.

- The CFDT representative declared that what is essential to their Union is that the HSWCC becomes a mechanism through which the problems of safety and hygiene can officially be discussed with the employer and management, he insisted on the necessity of Union's representatives in the committee.

- Te FO representative declared that "Management remains management" and that the old committee (HSC) had had difficulties in its functioning because of the attitude of management to it. He hoped that because the HSWCC is now entirely a worker s' representatives

committee, it will have a better chance of promoting health and safety as a result of the discretion and power provided by the new law.

- The CGT representative considered that the new committee will have an efficient role in the provision concerning the right to withdraw from a situation of imminent danger.

The whole debate revolved around aspects of Trade Unions representation, and left out the issues which this thesis shows to be most important for the effective functioning of the health and safety committee namely the election of the members of the committee, their competence, training and their role in terms of perception, analysis and choice of solution as specified by the law.

The overall picture from the discussion was that the committee will need considerably more back up from the trade unions than ever before. However the economic situation of the undertakings is leading reduced expenditure and increased redundancy and will oblige the committee to concentrate on job preservation and to leave aside the issues of health and safety.
The provision for workers representatives participation are very stringent and will incur much expenditure in terms of training fincance, time allowance, and new arrangement for occupational health and safety but the economic situation and recession is bound to weaken this effort.

6.3. CONCLUSION

Under these conditions there is no reason to believe that the HSWCC will be any more efficient in reducing accidents and occupational diseases than its predecessor the HSC.
The role of the HSC was limited because the training of its members was limited. The result was that they only pointed out superficial and obvious problems. Therefore they get no fundamental changes made and so they get no feedback of success, no sense of worth and no satisfaction.
The answer to satisfaction was to broaden the job. This was done by

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CFDT = Confederation Française de Travailleurs
CGT = Confederation Generale des Travailleurs
FO = Force ouvrière

by the amalgamation of the HSC and the working conditions committee through the law of 23d. December 1982 and the establishment of the HSWCC. This was based mainly on the argument that questions related to health and safety could not be dissociated from the broad area of working conditions which should include such aspects as working time, salaries, holidays, bourses, etc...
However broadening the domain of activity of the committee in this way creates further problems. The training will have to include the working conditions enumerated above and its content in safety and health will be squeezed
even further, given the statutory time allowed for the whole training. The issues to be discussed in the committee meetings will be too large given the limited number of apportunities specified.

What will still remain to be solved is the problem of effectiveness. The answer is to concentrate the training in a few people who can hope to carry out a deeper job in safety and health and let the committee keep on its shallow role.

G E N E R A L D I S C U S S I O N

1 - THE OVERALL PICTURE

The study presented so far indacates the existence of overlaps and rivalry between the four institutions analysed. It has been shown that the major source of overlap was the legal framework which established each of these institutions. The position of each of them is specified in law as a requirement for all organisations irrespective of size and nature of industry, (obligation to register in an occupational health service, obligation to register in the regional social security fund, obligation to establish a health, safety and working conditions committee and obviously the inspector of labour has the right of access and intervention in all undertakings). Their duties are defined by the legislation and cover actually all the aspects of health and safety as presented in the input-output model. Their respective trainings are also specified and carried out in specilised centres.

The study reveals that the interpretations made by these institutions of the duties legally assigned to them justify the claims which they make for the scope of their role in the field of occupational health and safety. But on the other hand the study reveals also that while the roles of these institutions overlap in large measure (e.g.inspection by labour inspectors and CRAMS' controllers and engineers) there is comparatively little coordination between them. In terms of training, for example, there is absolutely no coordination ; the training objectives are different, the contents of the syllabi are different, the training facilities and centres are different. Although the difference in content of sullabus is understandable because of the difference of backgounds between physicians and engineers, for example, what is less undestandable is the content of each of the training courses in relation to the objective of the role assigned by the legislation to the institution. The industrial physician, for example, is officially required by statute to spend one third of his working time on prevention of accidents which necessarily requires involvement on the workplace. But his training incorporates less than two hours lecture on this issue. On the other hand it incorporates occupational hygiene to such an extent

that no independant professional group exists under this name. Analysis of the other tasks allocated to him, notably an anual routine medical examination of all employees, and of the resources available to him indicated that, in actual practice, it is physically impossible to meet all of the demands.

The role of the labour inspector was first defined in connection with the regulation of child labour. It was mainly concerned with employment. It soon covered aspects of safety and health, and expanded as technology expanded bringing with it new dangers and corresponding specified regulations to be enforced by the inspector of labour. In the middle of the century the role of the inspector of labour was further broadened to include industrial relations and economic aspects. The current economic situation brought the employment problems to the surface again and the study indicates that the current role of the inspector of labour is predominantly concerned with employment and conflict solving at the expense of prevention of accidents and occupational diseases. His training incorporates comparatively very few issues of safety and health in comparison to legislation.
The labour inspector has always been encouraged to advice rather than enforce compliance, but the nature and depth of advice he had been able to give in occupational safety and health were limited by his competence and the breadth of other issues included in his activities.
The role of health, safety and working conditions committee is also institutional and the training of members of the committee and individual workers are spedified in law. However the content of the training and its organisation fall short of the training really needed to carry out the duties assigned to the committee in the field of safety and health.

Overall, the description of the duties of these institutions as specified in law gives an apparent picture of superabundance of specialist manpower. But the analysis of the actual role of each of them indicates that it is totally unable to fufill the role expected of it. The study reveals that none of the institutions has the right combination of expertise, time and influence to achieve more than superficial change.
A comparison of their actual activity with the issues presented in the input-output model shows that the majority of the phases of the model are not covered or superficially covered by one or two institutions.

Their activity is mainly concerned with the perception and monitoring phases of the model. The perception relies heavily on the periodic inspection tours of the workplace. No other methods are generally used. The monitoring is concentrated around aspects specifically defined by the regulations, in terms of standards to be achieved.

The picture of over-provision of expertise is therefore only, apparent and in reality room exists (and in fact needed) for further intervention in occupational safety and health . Nevetheless the situation, as it is, encourages professional rivalries and weakens the combined effort towards prevention of accidents and occupational diseases.

Though the evidence presented proves the existence of room for specialist expertise and advide in safety and health, the attitudes towards the institution of a health and safety function in the undertaking are rather hostile as shown by the evidence presented in the first chapter. The obstacles are linked with the doctrine held by the Ministry of labour and by management in general and also with the status of the rival groups. The study of the institutions revealed that they had strong historical, legal and institutional backing, and this status also justifies, their claims for the field of occupational health and safety. Furthermore these institutions seem to have convinced the legislator that they are adequately covering the needs in this field and therefore the difficulty resides in the demonstration that their claims are inadequate.

It could be argued that health and safety has developed, traditionally, through the recognition by the industrial physician of the link between occupation and frank disease hence his historical dominance in the field and his current claims for it. To some extent, this is understandable as long as detection is through clinical effect on the individual and control is by individual hygiene and health care. However, as expressed in the model, activities such as referral to general practitioners or specialists, rehabilitation of victims returning after treatment and yearly medical examinations are post accident and collateral strategies whose objectives are only remotely concerned with prevention of accidents. Similar criticisms could be levelled to much of the activities of the social security funds and the labour inspectorate as described in the study.

The input-output model established that perception, analysis and control of danger can take place using earlier detector and more powerful methods such as environmental monitoring, design standards, and hazars and operability studies. And the resources available to the industrial physician, the inspector of labour and the social security engineer (in terms of training and competence) fall short of the mix of skills necessary to use these methods. From this point of view the argument is sufficient to establish the need for a health and safety specialist who has the mix of skills required to interverne in the field.

The argument could be, justifiabily, backed up by financial arguments, the need for rational allocation of resources and their effective use. The evidence on this issue, though very scarce, is convincing. The services provided by these institutions impose a nett financial burden on the undertaking (see e.g. LETOUBLAN 1979). He established that the establishment of an autonomous health service costs 600 francs/worker/ year to the undertaking. The employers declared that this system takes over costs which would otherwise be born by the National Health Service or the Social Security Funds, as discussed in the previous chapter.

The mix of skills necessary is provided by the IUT and similar safety and hygiene courses. But the contribution of people trained in these courses to the prevention of accidents and occupational diseases in the undertaking has always been undervalued for a number of reasons. Their contribution is diluted with the contributions of the many institutions intervening in the same field, the safety performance is difficult to measure because of lack of objective criteria (see chapter 2) and, above all, because of the current status of the health and safety specialist working in the undertaking, in comparison to the other actors presented so far.

2 - THE STATUS OF THE HSS -

It has been mentioned (chapter 1) that the Ministry of labour holds the view that a genuine rise in the status of the HSSs would only come about if the employers recognise the importance of the subject and perceive the need for HSS's assistance in the field. My discussions with people concerned with health and safety in the course of the research and during the interviews revealed that the majority of people hold the view that the HSSs would not reach a professional status so long as the employer can employ who he will as his safety practitioner, irrespective of the person's ability and competence. To some extent this is true and the description of

the current situation of the HSS, as given in chapter 1, illustrates this point. On the other hand, it could be argued that this is a very narrow view and could in fact be applied to many occupations.
It could also be argued that despite the employer's normal freedom of choice in appointing his employees or assistants, in this field the legislation imposes on him the industrial physician, the social security engineer and obviously the labour inspector, though the latter is not directly payed by the employer. It was already mentioned that the work load of these people is organised in geographical sectors and therefore the employer has no discretion in the choice of the person providing the service for him.

Legislation is not likely to change the situation of the HSS in the near future. At present neither the Ministry of labour nor any of the powerful parties in the field are in favour of an institution of a mandatory safety function in organisations (DELEBARRE 1985 and De TAILLAC 1985).
Even if the legislator could be convinced, one day, of the necessity of a mandatory safety function, there is no garantee that such a legal provision would provide the necessary expertise and competence to further safety and health at work. Indeed such a provision might well lead to the creation of a fifth or sixth institution similar to the ones that have been studied, and functioning, more or less, in the same way. From this point of view the relevance of a mandatory safety function in the undertaking is therfore questionable. Howewer the recent legislation specifies the employers' duties in the form of general objectives. The employers will therfore seek expertise and advice which will enable them to conform to these objectives. The quality of expertise and advice given to management on these issues will rise the status of the HSS holding the expertise. This trend will ultimately settle the domain as a profession. This seems an attractive solution, but it needs further analysis in the context of professionalisation.

3 - CHARACTERISTICS OF PROFESSION -

The existing body of knowledge about professionalisation and professionalism is extensive (MAURICE 1979). COGAN (1953) reviewed several authors in sociology who had offered descriptions of what they regarded as key elements of profession. He argued that most of these authors used more or less the same criteria in order to make the difference between

a professional and a non-professional occupation. According to him, the main elements on which most of the definitions were based date back to the definition of FLEXNER (1915). He added that there has not been much progress in the field and much of the work carried out was rather repetitive.

MAURICE reviewed eight writers in this field and arrived at similar conclusions, referring also to the definition of FLEXNER.

The six criteria proposed by FLEXNER are :

- skill based on theoritical knowledge and related to high individual responsibilities
- the material used must be drawn from science
- application of principles to concrete professional practice
- the knowledge and competence must be transferable through teaching
- self-organisation
- altruistic service

MAURICE argues that the major reason of this state of affairs is the illusion of wanting to base a concept on simple observation of social practice.

BECKER rejected this approach and suggested the use of a rather simple definition, he considered that "*the professions are simply those occupations which have had enough chance to gain and preserve an honorific title in the current employment market*" (see HENRY 1962). This definition was based on the prestige in the employment market and also linked the prestige with the utility of the role of the professional to the functioning and survival of society. The relevance of such a definition is currently questionable on several grounds. The dustman, for example, is at the bottom of the scale of prestige in society, yet a strike of the dustmen in a city like Paris, brings the whole city to a stand still. On the other hand the practice of medicine and its effects on the health of people is now subject to wide chriticisms and yet the physicians still have the good prestige and reputation they have gained for so many years (ILLICH 1975).

WILENSKY (1964) analysed profession and suggested the following definition :

> *"Any occupation wishing to exercise professional authority must find a technical basis for it, assert an exclusive jurisdiction, link both skill and jurisdiction to standards of training, and convince the public that its services are uniquely trustworthy".*

According to WILLENSKY professionalisation comes from conformity to a set of moral norms. The professional must do his work competently and must devote himself to the service ideal. The criteria of WILENSKY involve also the setting of professional standards, and the recognition of hierarchies of competence. The professional is expected to keep up standards of professional competence. He must recognise the authority of his colleagues and be prepared to refer his clients to more competent colleagues when necessary.

Surely this definition includes the six elements proposed by Flexner, but WILENSKY introduced further elements related to power, voice and advancement of vocation.
JOHNSON (1972) defined the prefession in relation to the means it can provide to control the occupation it is associated with.

ATHERLEY an d HALE (1975) have been very much influenced by JOHNSON and WILENSKY and concluded that "*a professional occupation is one where there is a service of some kind based on knowledge and given to a client and control is exercised over the occupation*".
The authors regarded the question of control over an occupation as the central issue in the development of a profession.

ATHERLEY and HALE reviewed the prospects for the development of a profession based on occupational safety and health. Their study highlighted a number of obstacles to professionalisation and concluded that the then recently introduced, Health and Safety at Work Act 1974 in Britain provided the opportunity which groups in the field could grasp to overcome them. The main opportunity was the specification of the employers' duties in terms of general safety objectives to be achieved. The current French legislation (law of 6th December 1976 and 23 rd December 1982) laid down similar requirements and it is therfore appropriate to examine the French situation within this framework.

4 - THE CURRENT OBSTACLES TO PROFESSIONALISATION IN HEALTH AND SAFETY -

The obstacles to professionalisation identified by ATHERLEY and HALE were based on the study of MILLERSON (1964). Table 1, gives the list of items regarded as the obstacles.

1 - insufficient internal, or external, pressure to form an organisation
2 - underdevelopment of subject matter and/or practical technique
3 - great variations in quality of service provided, training received by pratitioners, level of study, type of employment, social origins
4 - rivalry between occupations and organisations
5 - Small numbers of practioners
6 - Geographical isolation
7 - Underdeveloped governmental industrial or commercial structure
8 - Absence of enterprising individuals
9 - Lack of clarity over the client for whom the practitioners are providing the service

Table 1 : Obstacles to professionalisation from MILLERSON (1964) as reported by ATHERLEY & HALE ; the 9 th. item is from ATHERLEY & HALE.

The evidence provided in the preceding chapters suggests that health and safety is a developing occupation in France. Whether this development results in a viable profession depends, to a large extent, on the type and strength of the obstacles it meets on its way and the ease with which it is likely to overcome them. The data for evidence is largely contained in the study and analysis presented so far. The procedure at this stage is to link these data to the appropiate items of the table, assess the strength of the obstacle and suggest ways to overcome it.

4 - 1 - Pressures for development of a profession : The pressures for the development of the profession of safety and health may be internal and/or external to the undertaking. In this sense pressure from legislation is considered external and pressure from workers' commitees, for example, is considered internal.
It was mentioned that the law of 19 th August 1977 established Interworks Health and Safety Panels and Safety Policy and many HSSs vere recruited to carry into effect the decisions of the panel and the prescriptions of the safety policy. But the law did no prescribe the employment of the HSS. Moreover, in respect of the number of undertakings in the construction and public works in France this provision covered only 16 % of the total.

The law of 1947 on health and Safety Committees specified that the HSS shall be the secretary of the committee but in organisations where there is already one employed. It was not mandatory to recruit one for that purpose. This law is now replaced by the law of the 23 rd December 1982, and no mention of the HSS is made within it. But at the same time it provided other enablements which would result in pressure on the employers to appoint HSSs. This possibility will be discussed at the end of the thesis. At present no direct statutory provision is likely to be issued so long as the Ministry of labour holds to the principle of integral safety and the right of management to manage. These are obstacles which will be overcome in the light of the spirit of the new legislation. These possibilities will also be discussed at the end of the thesis.

4 - 2 - Lack of recognised subject area : The fact is that there are far too many variations of process and organisations to enable one work schedule for the HSS to have universal application. The review of the training courses discussed earlier indicated that there is a large disagreement on the purpose of the course and its content. But, as ATHERLEY and HALE suggested the diversity of knowledge need not in itself be a barrier to common professional development provided that there is an agreed common denominator to bind it together. A survey was designed to gather the main constituent elements of this denominator as seen by various groups concerned by the prevention of accidents and occupational diseases. The survey and the results will be presented in the subsequent chapters.

4 - 3 - Diversity of jobs, people and service : This is intimately linked with the lack of recognised subject area. The job is currently held by people of various backgrounds running from highly qualified engineers to non-formal qualified animators.
ATHERLEY and HALE reckon that the divesity of people is a strong barrier to comprehensive organisation. They argue that : "*the highly qualified feel it beneath their dignity to associate with unqualified and the specialists feel it more appropriate to retain their groupings than to join in a larger association*".
At present the associations of HSSs in france include members from various backgrounds and different levels. The binding factor within the associations is the practice in the domain of health and safety. The AFTIM, for example, contains as many as 90 industrial physicians and also some 40

lawyers.
The divisive strain of technicians vs graduate members does not appear at present, the associations seem well aware of the difficulties it will create in the development and promotion of the occupation.

4 - 4 - Rivalry of organisations : In addition to the four institutions studied earlier, there are a number of consultant bodies which were originally created for specific reasons to assist the employers on particular standards of safety but which have extended their activities to cover all aspects of health and safety in the undertaking. The major bodies are the APAVE and the AIF, but there are other groups which have recently emerged, the North Region Ergonomic Group (GERN 1979) is one example of these groups.
Exept for the mandatory inspections like the periodic inspections of boilers, their intervention in the undertaking is entirely at the discretion of the employer. Their status is of a consultant nature and their credibility depends on their competence in the field. The survival of these bodies will depend on their performance and the results they will achieve in their in-plant activities. Their success contributes to the development of the profession as the demands imposed on them will create need for expertise and competence which in turn develops the occupation. Their failure leaves further room in the undertaking for full time HSSs to be employed. The main difficulty is therefore related to the status and attitudes of the four institutions of lagal basis.

4 - 5 - Number of practitioners : If the number of graduates of the IUTs is of any significance. There are approximately 2000 technicians in health and safety. These institutions are continuing to train some 250 students each year.
The number of the members of the AFTIM is a further indication. There are also at least six other associations at regional levels, the AITASA mentioned earlier is one of them.

4 - 6 - Isolation : Although there are many associations in the field of occupational health and safety, some of them on a regional basis, they all share the same objective : the development of health and safety methods and techniques and also the promotion of the safety function. The joint reports for the recognition of the safety function refe_red to

earlier are a clear evidence of their unity. With the aid of the communication means which exist today the problem of isolation should be easily solved.

4 - 7 - Undeveloped governmental, industrial structure : ATHERLEY and HALE reported that only complex employment structures, technologies or organisations are favourable to professionalisation. They suggested that the field of occupational health and safety satisfied these criteria. The French situation bears large similarities,with the British industrial context and these criteria are also satisfied in France too.

4 - 8 - Enterprising individuals : Judging by the number of applicants each year, there is no doubt that it is very high (over 2500 applicants to the IUTs courses alone). Only 10 % are accepted on the course, nevertheless the figures indicate that the field is attractive.
The crucial question is the chance of employment and also the lieu of employment, and associated advantages if there are any. These issues will also be considered in the survey.

4 - 9 - Uncertainty over identity of client : From the statutory point of view the HSS is an employee like any other worker and on that basis he offers his service to the employer. In practive the animator who carries out his duties within the activities of the HSWCC may be considered as giving his service to the committee and his client is therefore the workers. On the other hand the engineer acting as staff will be considered like any other manager of the organisation and will be offering his service to the employer.
The current nature of the job of the HSS does not offer a clear identity of the client. There is no legislation clarifying the situation as it does in the case of the industrial physician. In this case the law of 1946 establishing occupational medicine specifies that the physician is an employee of the organisation but offers his service to the employees. As such he has a large power and discretion in carrying out his duties and is not subject to the employer's authority.
From this point of view some sort of mediative control will utimately be needed, but this is not the crucial stage in the process of developing a profession.

5 - CONCLUDING REMARKS -

Clearly the nine factors which have been discussed are not independent, indeed they are highly inter-related. One way to view the situation is a set of negative and positive forces acting together. The preceding analysis reveals that there are at least four positive forces but their intensity is not sufficient enough to overcome the negative forces. Items 5, 6, 7 are positive forces in the sense that they are acting for the recognition of the health and safety function. Looking at item 7, for example, it is evident as ATHERLEY and HALE suggest that complex employment structures and technologies are favourable to occupational health and safety but this state has also favoured the intervention of numerous bodies, institutions and individuals in the field, all of them claiming jurisdiction over it (point 4). The existence of enterprising individuals and associations pressing for the recognition of the status (point 8) is also a positive force but its intensity is weakened by the fact the Health and Safety funtion is solely seen as an advisory one. One would argue that this is related to the absence of written job specification, and the fact that the job is defined according to the demands of others, and therefore the issue lies in the hands of the employer. However this is a dangerous game especially in the current economic context. Cost-conscious managers will certainly choose to get the same advice form outside consultants at a lower expense. The increasing number of group occupational health sevices is a good indication of this attitude.
The negative forces have a much greater intensity and are also highly inter-related. The variations in quality of service may be linked with the underdevelopment of subject matter. The existence of rivalry may be due to the lack of a clear definition of the field of expertise and its boundaries. The intensity of a "force" depends on the body which expresses it. In this case the opposing forces are strongly entrenched.

The historical and even legal dilution of the roles of the various institutions for so many years makes it difficult for the legislator to envisage an overnight solution through a statutory text which clarifies the different roles. It was mentioned, in connection with the inspector of labour and the social security engineer, that several memorunda had been issued from the Ministry of Labour in order to develop close collaboration between the two bodies. The spirit of the texts, as mentioned

earlier, was attempting to situate the usefulness of the information from one institution to the other, but in practice both institutions were reluctant to this exchange of information and it was therefore limited to the information strictly specified in the regulations and legally required.

One possible solution to the development of the health and safety occupation would be, under these circumstances, a full health and safety team in wich the HSS would try to find his room. It must be stressed that though the existence of this room was established through analysis of the activities of the other actors a good deal of effort is needed to make these actors appreciate the situation.
The attitudes of these actors towords the institution of a health and safety function in the undertaking do not promise much chance., The team approach is one way of escaping the rivalry ideas and beliefs.

The remaining part of the thesis is concerned with the development of a survey which tries out this approach. The object was to establish the extent to which the various institutions would accept the integration of a HSS within their team and what role they would assign to him. The survey covered the main parties concerned by the prevention of occupational accidents and occupational diseases.

CHAPTER 7

THE DESIGN OF THE SURVEY

The survey was carried out through mail questionnaires. Despite its drawbacks such as the possibility of low response rates, the introduction of bias, and the inability to provide additional information to the respondent (see e.g. OPPENHEIM 1966), the method was judged appropriate in this case for the following reasons :

- The number of people holding the required information in any one particular location of an institution was too limited to be statistically significant, for example there are only four to five ingenieurs conseils in any one CRAM and visiting the 16 CRAMs in France would have been physically and financially impossible.

- In addition some interviews and direct observations had already been used in the areas of Bordeaux and Orleans in connection with data collection related to the other domains of research discussed in the previous chapters. It was not easy to return to the same institutions for different research purposes. This was particularly so, as in one case, the enquiry was about the role of the institution itself and in the other about someone else's role (the HSS).

Mail questionnaires were therefore chosen because their use allowed the coverage of larger samples at relatively low costs. Even so, the number of questionnaires distributed was rather limited. However the information collected is very rich ; it gives further supporting evidence to the preceding sections and suggests further points of studies

and research.

This chapter presents the details of the design of the survey and discusses the preliminary analysis in terms of quantity and quality. Deeper analysis will be presented in the subsequent chapters.

7.1. QUESTIONNAIRE DESIGN

The design of the questionnaire involved two steps :

- To compile a comprehensive list of tasks carried out by the health and safety specialist in his day to day activity. This was the pilot study.
- Submission of this list in the form of a questionnaire, quick and easy to complete, to a large number of practicing HSSs and to other actors involved in the prevention of accidents and occupational diseases in industrial organisations.

7.1.1. THE PILOT STUDY

The pilot study was based upon the Syllabus Review Project carried out by the British Institution of Occupational Health and Safety in collaboration with the Department of Environmental Health and Safety of Aston University in 1983. That project employed a diary form to collect information on the activities of safety advisers (HALE 1983 personal communication). The diary form was translated for use.

Twenty practicing HSSs (all of them members of the AITASA) were asked to keep a diary of their activities for one or two weeks. The proforma of the diary is provided in appendix 3 . It included three separate sections : the activities that the HSS carried out, questions about health and safety that the HSS was asked and information he had to ferret out. Corresponding to each section, information was also required on the time every activity took, the author of the question(s) and the source of information the HSS used.

Although the interest and purpose of the study were clearly explained

at one association meeting, only five replies were received. It was therefore felt necessary to complete this exercise by a series of ten interviews with serving HSSs. The interviews were structured more or less in the same way as the proforma of the diary. The HSSs interviewed were chosen from undertakings of 500 to 1 500 employees. All of them were working in a health, safety and working conditions departments. In 7 cases this department was an advisory unit which reported to the managing director, the remaining 3 cases were units in the Industrial Relations Department of the organisation. All the interviews took one morning or one afternoon as they involved also a visit to the undertaking. The object being to compile an exhaustive list of tasks, everything that was mentioned during the interview was noted down.

A study of the information collected during the interviews and from the five diaries provided a list of 51 items, which made up the questionnaire. Before the description of the questionnaire some general comments on this preliminary study are worth mentioning at this stage.

7.1.2. PRELIMINARY COMMENTS

There was a general agreement on the activities carried out regularly. These were :

- Analysis of accident investigations
- Safety campains
- Preparation and organisation of HSWCC meetings (which take place regularly on a quarterly basis)
- Workers training

The responses to the question on the daily activities and the corresponding time are summerized in Table7.I The times given are the average for the sample.

The unanimity of the responses as to the list of daily tasks was remarkable (thouth the sample is small). All the respondents mentioned all of these activities, during the interview. They emphasised that the visit to the works sick bay was a golden rule.

They argued that it was a source of information on accidents and in-

Activity	Time
Visit to sick bay	1/2 h
Issue work permit	1/2 h
Reading the mail	1/2 h
Meeting with foremen of W. shops	1/2 h
Inspection tour	1 to 1/2 h
Administrative task	1 to 1/2 h
Literature search and reading	1 h
Writing	1 h

Table 7.1. Daily Activity of HSS

cidents because the injured person tells everything about the circumstances of the accident while he is being treated by the nurse or the physician.

All the respondents insisted on the value of the inspection tours in the factory, arguing that this was one type of "perception" method which was generally not open to the workers on the job and their foremen because of their familiarity with the process. They claimed that, except for the mandatory inspections such as those concerning pressure vessels where a specialised technician is called in, the HSS is the only person in charge of the monitoring of the system. However it was clear that there was no systematic method of carrying out the inspection. They just kept their eyes open when they passed through particular parts of the plant and also listened to any complaint from any worker. The need for competence and training in human relations was frequently mentioned in this context.

The daily meeting with the foremen of the diffrent workshops was systematic, an its agenda included everything related to the daily running of the process ; the HSSs attended this meeting to collect any question related to health and safety and to raise questions himself. He might draw attention to something wrong he had noticed during his last inspection tour. He would try to include this item in the minutes of the meeting.

The HSSs declared that they need to spend more time on reading the health and safety magazines, since they reckoned that these magazines provided up to date information on methods and techniques which might

be relevant to their particular needs.

It was mentioned frequently during the interview that they had difficulties in planning the days activities as they were often solicited for advice, particularly through phone calls. The requests came from all the levels of the hierarchy including the workers. However there was a large variability in the nature of the questions. Workers and particularly members of the HSWCC tended to take up a variety of issues ranging from purely technical, such as the measurement of the noise level at a particular work station or the possibility of defeating a machine guard, to more trivial problems such as the queueing time in the factory restaurant. The issues raised by managment tended to be legislative and aim to clarify their duties to the employees. The requests of line management tended to be precise and more specific, and ones for which the HSS generally had no immediate answer. The main sources of information referred to, in such cases, were group safety and health departments, the National Institute of Safety Research (INRS) and private consultant bodies such as the Association of French Industrialists (AIF).

Except in power stations and the petro-chemical industry, safety audits, and preventive plant maintenancewere not systematically used. Thus the HSS activity was dominated by spot interventions reacting to the calls of others, especially members of the HSWCC. Though there was no institutional liaison between the committee and the HSS, there was evidence that the role of the HSS depended to a large extent on that of the committee.

All the HSSs interviewed described their roles as advisers of management and workers and no one claimed to do things himself. Moreover they all rejected the idea that they had responsiblility for health and safety on behalf of the organisation, (this confirms the low frequency of occurence of the title RESPONSIBLE in the AFTIM sample discussed in chapter 1).

With this background information and the 51 items compiled, a formal postal questionnaire was constructed.

7.1.3. THE QUESTIONNAIRE

The 51 items compiled from the preliminary study were classified according to the elements of the Input-Output model presented in chapter 2. They were labelled A,B,C, to G designating the domain of activity (A), the stage of activity (B) and the depth of action (C to G). In each element the tasks were further classified according to the depth of involvement required of the HSS. Thus in perception of danger, for example, a distinction was made between perception of danger through routine inspection tours in the workshops versus perception through use of specific hazard analysis methods such as Fault Tree or Failure Mode Analysis.

The list of items thus classified was presented on three A5 sides of paper headed by a single instruction which was worded differently depending on whether it was addressed to the HSSs or to the other actors ; (see appendices 4 and 5 for the corresponding questionnaires).

The instruction to the HSS read like this :

> *"We have listed a number of tasks related to the prevention of accidents and occupational diseases in the undertaking. According to your own experience in the profession, please mark from zero to three (0 to 3) each of these items depending on whether the item in question :*
>
> - *has never been part of your job (mark 0)*
> - *has seldom been part of your job (mark 1)*
> - *has frequently been part of your job (mark 2)*
> - *has always been part of your job (mark 3)*
>
> *Each item should be marked independently from the others. All the items should be marked. You mayadd comments on each item to give a precise interpretation of the item, and the mark you give to it".*

The responses to this questionnaire were designed to give a good picture of the current role of the HSS, backed up by the brief description gained from the interviews and diaries discussed previously.

The instruction on the questionnaire addressed to the other actors read like this :

> *"According to your own professional experience ; please mark*

from zero to three each of these items depending on whether you consider that for the job of the health and safety specialist :

- *It should never be part of his job (mark 0)*
- *It should seldom be part of his job (mark 1)*
- *It should frequently be part of his job (mark 2)*
- *It should always be part of his job (mark 3)".*

The responses to this questionnaire were designed to show the role of the HSS as expected from each of the other actors. Further information would be gained from the comparison of the results from each category. These will be discussed in appropriate sections, later in the text.

The HSS questionnaire included 5 other separate questions to determine the characteristics of the respondents. The questions were related to the type of process of the organisation where the HSS was employed, its size, its type of safety organisation, the job title of the HSS in that organisation and whether he was more of an adviser or a doer in his role. It would have been valuable to have asked a question about the training of the respondents but it was felt that those who had no specific training in health and safety would have been discouraged from replying, so this idea was reluctantly dropped.

It was not appropriate to ask the other actors the same questions, related to the characteristics of the undertaking because they are involved in the prevention of accidents and occupational diseases in all undertakings irrespective of type of process and size of organisation. These questions were therefore phrased in a slightly different manner. The respondent was asked to give his opinion on the types of industries and organisations and also the size of the organisation where he thought the employment of the HSS was necessary.

The questionnaire was accompanied by a letter explaining the purpose of the study and emphasising the value of the information given for the design of adequate health and safety courses. It was also emphasised that the questionnaire was anonymous and the replies would be strictly confidential as they only served an academic purpose. An example of the letter is provided in appendix 6.

7.1.4. DISTRIBUTION OF THE QUESTIONNAIRE

It was intended to include in the survey all the parties concerned with the prevention of accidents and occupational diseases in industrial activities.

The only source of names for the HSSs were the membership lists of the HSSs associations. There are six different associations and this raised the problem of multiple membership. To overcome this problem, only the lists of the AFTIM were chosen because it is the main national and largest association. It includes some 1 350 members.

A sample of 200 HSSs among those employed in industrial activities was selected for the questionnaire. The lists did not indicate the full characteristics of the organisation where they are employed and the five additional questions discussed above were designed to rectfy this deficiency. This also meant that the sample could not be chosen in advance to concentrate on specific industrial sectors. A further reason why such a concentration was not desirable was that the other actors were all concerned with the prevention of accidents and occupational diseases in the full range of industries and organisations irrespective of type and size. This meant that their views of the HSS role would be based upon a global picture and not just one sector. Hence a random sample was taken from the list.
A sample of 200 industrial physicians was taken from those serving in interworks medical services (services interentreprises de medecine du travail). It has been already explained that this form of medical service is the most predominant in France. Four such services were covered (Bordeaux, Clermont-Ferrant, Lille, Orleans), chosen to be widely separate geographically and in types of industry. All physicians within the service received a questionnaire.

As described earlier, there are 5 to 6 ingenieurs-conseils in each C R A M. The sample of 110 was the total population in all the 16 C R A Ms.
The sample of 150 labour inspectors was the total population of inspectors who carried out field inspections, (Controleurs and chief inspectors were excluded). The questionnaire was distributed via area

chief inspector (Directeur Regional du travail et de l'emploi).

As mentioned earlier, there are 4 established hygiene and safety departments in 4 different I.U.Ts in France. Two of them with which contact was particularly good were covered in the survey (Bordeaux and Lorient). The sample was 40 full time lecturers. This category was included in the survey not because they are directly involved in the prevention of accidents and occupational diseases in the undertakings, but because of their wide experience in training health and safety technicians for the last ten years. They also have valuable experience of industry through the industrial training of final year students.

It is the employer who decides the need and requirements of a HSS. He specifies his position in the hierarchy, his job title and above all he defines his role. It was therefore important to include this category in the survey. The difficulty was that compared to other categories, the rate of response is very difficult to predict. Another problem was the tendency of the employer to froward the questionnaire to his HSS to deal with it. Finding a list of organisations large enough to warrant the employment of a HSS proved difficult. The most convenient source was the lists of firms belonging to local chambers of commerce (Chambres du Commerce). Even here the labour of extracting appropriately sized firms was great and could only be done on the spot. Nevertheless a sample of 100 employers was taken form these lists among those employing 100 employees and more, in two areas (Aquitaine and Loiret). The questionnaire specified that it should be completed by the employer himself.

Bodies like APAVE (Association des Propriétaires des Appareils à Vapeurs et Electriques) are extensively involved in inspection of equipment and apparatus and also in consultancy activities related to health ans safety in general. The regional group in Bordeaux was consulted with a view to joining the survey, but apparently did not appreciate the usefulness of the project and refused to respond. A similar attitude was met in the main consultant body A I F (Association des Industriels de France).

It was thought that members of the HSWCC in the undertakings could be reached through the Trade Unions. Unfrotunately all those approached also refused to get involved in the survey.

7.2. PRELIMINARY ANALYSIS

The total number of questionnaires distributed to the HSSs and the various actors presented thus far, was 800. Table 7.2 shows the response rates from each category of actors including the HSSs. The capital letters T, M, C etc. are labels which will be used in the graphs of the subsequent chapter.

Category of Population	No. Covered	No. of Resp.	Percentage
H S S s (T)	200	62	31
Ind. Phys. (M)	200	52	26
Ing. Cons. (C)	110	30	27,2
Lab. Insp. (I)	150	35	23,2
IUT Lect. (E)	40	20	50
Employer. (P)	100	19	19
TOTAL	800	218	27,2

Table 7.2. Categ. of pop. and Resp. Rates

No reminders could be sent to most groups as the questionnaire was sent anonymously. However considering that the response rate for surveys of this kind in France is generally 10 to 15 % (YRIBAREN 1975) the rates obtained in this survey are clearly above these levels. The lowest rate is that of the employers (19 %), it was expected for the reason discussed earlier and also probably because of the daily work load and involvement of these people.
The highest rate is that of the I U T lecturers (50 %) and this is because most of them are colleagues of the author and so multiple reminders could conveniently be made.

In general one could say that the response rates show the interest which the various groups have towards this research topic. This interest was in fact expressed on several occasions during the visits

the author made to the various institutions in connection with the first part of this work which was discussed in the preceding four chapters. Another indication of this state of affair was found in the letters which accompanied some responses. Many individuals and institutions expressed the desire to see the results of the survey. The letters also indicated that the questionnaire was well understood and appropriately interpreted.

Table 3, shows the mean score for each item, as marked by the total population. It shows also the standard deviation corresponding to the 218 marks scored by each item.

The mean mark ranges from a minimum of 0,63 to a maximum of 2,94. The maximum mark is scored by the item A_1 "prevention of accidents" which is not surprising as it should be expected to be one of the main activities in the job of the HSS. The minimum mark was scored by item C_8 "audiometry" this was again expected as it is regarded as the job of the industrial physician or the nurse.

Whereas the standard deviation on A_1 is very low showing a strong agreement within the population, the standard deviation corresponding to C_8 is relatively high which indicates a rather large dispersion of opinion among the population. A similar value was scored by item C_9 "checking of worker's fitness for his work station", the standard deviation is again relatively high. This activity is also considered to be strictly in the industrial physician's competence.

Some items scored high marks with a relatively low value of the standard deviation, these are thought to be strictly within the domain of activity of the HSS, (see for example C_1, C_2, E_{11}, and E_{12}). Other have high marks but relatively high values of the standard deviation and their interpretation needs deeper analysis. This will be carried out in the subsequent sections.

LEVEL OF IMPORTANCE OF VARIABLES

	Mean	Standard deviation	Min.	Max.	Label of variable
A1	2.945	0.327	0.0	3.0	Concern themselves with accidents
A2	2.482	0.836	0.0	3.0	Concern themselves with diseases
A3	1.261	1.084	0.0	3.0	Concern themselves with material damage
A4	2.583	0.816	0.0	3.0	Concern themselves with fire prevention
B1	2.619	0.752	0.0	3.0	Contribute to design of plant&equipt.
B2	2.688	0.719	0.0	3.0	Contribute to develop. of safety policy
B3	2.229	0.890	0.0	3.0	Oversee plant maintenance
B4	2.399	0.847	0.0	3.0	Develop safety rules
C1	2.683	0.688	0.0	3.0	Carryout workplace inspections
C2	2.670	0.685	0.0	3.0	Carryout accident investigation
C3	2.330	0.954	0.0	3.0	Carryout inspections of safety features
C4	2.096	1.098	0.0	3.0	Develop acc. & dis. statistics
C5	2.023	1.007	0.0	3.0	Reliability analysis (FTA, FMEA)
C6	1.798	1.052	0.0	3.0	Carryout sampling
C7	1.450	1.137	0.0	3.0	Carryout non destructive testing
C8	0.628	1.030	0.0	3.0	Organise audiometry testing
C9	0.775	1.054	0.0	3.0	Check worker's fitness
C10	1.514	1.085	0.0	3.0	Take part in planning of maint.interv.
D1	2.578	0.746	0.0	3.0	Analysis of causes of danger
D2	2.142	0.992	0.0	3.0	Potential consequences of danger
D3	2.468	0.841	0.0	3.0	Evaluate probabilities of danger
D4	2.064	0.964	0.0	3.0	Carry out job safety analysis
D5	1.881	1.073	0.0	3.0	Organise expert intervention
D6	1.972	1.157	0.0	3.0	Interpret hygiene and safety regulations
E1	1.720	1.040	0.0	3.0	Carry out accident cost analysis
E2	1.913	1.103	0.0	3.0	Carry out cost/benefit for prevention
E3	2.367	0.820	0.0	3.0	Developing technical solution
E4	2.445	0.778	0.0	3.0	Calling in external consultant
E5	2.509	0.847	0.0	3.0	Organise worker training
E6	2.197	0.964	0.0	3.0	Choose personal protection equipement
E7	2.248	0.992	0.0	3.0	Composing safety rules
E8	1.711	1.087	0.0	3.0	Propose changes in w. scheduling
E9	1.780	1.448	0.0	3.0	Issue work permit
E10	2.216	1.055	0.0	3.0	Stop w. proc. or mach. for im. danger
E11	2.638	0.607	0.0	3.0	Make workers aware of dangers
E12	2.752	0.645	0.0	3.0	Persuade manage. of need of safety
E13	2.737	0.549	0.0	3.0	Explain to manag. their duties
F1	1.986	1.123	0.0	3.0	Make cases for a specific budget
F2	1.326	1.149	0.0	3.0	Make cases for grant
F3	2.106	0.983	0.0	3.0	Discuss implementation
F4	2.766	0.632	0.0	3.0	Take part in HSSWCC meetings
F5	2.161	1.107	0.0	3.0	Keep up to data safety data
F6	2.596	0.699	0.0	3.0	Overseeing of comp. with regs.
F7	2.188	0.946	0.0	3.0	Require installation of saf. equipement
F8	1.436	1.164	0.0	3.0	Hand out personal equipement of protectic
F9	1.138	1.157	0.0	3.0	Carry out mentenance of pers. prot. equi.
F10	2.555	0.710	0.0	3.0	Carry out safety campains
G1	2.408	0.837	0.0	3.0	Put into effect inp. notices
G2	2.248	0.959	0.0	3.0	Checking atmos. levels to standards
G3	2.367	0.820	0.0	3.0	Put into effect training programs
G4	2.431	0.892	0.0	3.0	Monitoring compliance with safety rules

Table 73. Mean Score and Standard Deviation of the marks.

CHAPTER 8

UNIDIMENSIONAL ANALYSIS

The methods used for analysis and interpretation of the collected data involve uni_dimensional statistics and mutidimensional techniques. In the former category use is made of the mean, the standard deviation and the histogram. The second category includes principal components analysis, discriminant analysis, and factor analysis.
The questionnaire was designed to discover the current role of the HSS and also his role as desired by the other actors and the analysis will be presented in this order. This chapter presents the unidimensional analysis of the data. The following chapter presents the multidimensional analysis.

8.1. THE CURRENT ROLE OF THE HSS

The following is concerned with the analysis and discussion of the responses to the questionnaire of the sample of serving HSSs, members of the AFTIM.

8.1.1. CHARACTERISTICS OF THE RESPONDENTS

From the 62 replies in this category only 55 respondents gave factual information required by the additional five questions included in the questionnaire. These are dealt with in order of the questionnaire format.

8.1.1.1. TYPE OF ACTIVITY AND SIZE OF ORGANISATION

Table 8.1 indicates the various types of activities and sizes of organisations covered by the HSS questionnaire. The classification was carried out according to the French Industrial Classification used by the labour inspectorate and the social security funds.

SIZE / ACTIVITY	100 - 500	500 - 1500	1500+	TOTAL	%	Nat %
Metallurgy	5	9	9	23	41.8	7.3
Construction	2	4	5	11	20	16.6
Chemical	2	2	0	4	7.2	0.4
Printing	2	0	1	3	5.4	1.6
Electrical	0	2	2	4	7.2	0.2
Coal Mining	0	1	2	3	5.4	0.9
Others	0	4	3	7	12.7	72.9

Table 8.1. Classification of type and size of organisations of HSS respondents.

8.1.1.2. SAFETY ORGANISATION AND JOB TITLE

All the respondents indicated that they were working in health and safety departments. In seven undertakings, all of more than 1 500 employees, the department was divided into three units : Fire Prevention, Systems Safety and Working conditions.
The more common model was a combined Safety and Working Conditions Department (48 Cases).

Even with such a small sample, there was a great variability of the job titles of the respondents. The questionnaire provided four possibilities : Engineer, Technician, Animator and Others. Table 8.2 gives the percentages of appearence of these titles in the sample.

Title / Size	Engineer No. %	Technician No. %	Animator No. %	Others No. %
100-500	3 (11)	4 (40)	4 (40)	0 (0)
501-1 500	9 (35)	5 (50)	4 (40)	4 (44)
1 500 +	14 (54)	1 (10)	2 (20)	5 (56)

Table 82. Relationship of job title and size of undertaking.

Under the title "Others" the respondents indicated as many as five other titles making a total of eight different titles.
The figures are too limited to give any significant relationship between job title and size of organisation. The indication is that the titles Technician and Animator are equally used in undertakings of less than 1 500 employees. This has to be checked with the type of activity. The title engineer is used in undertakings of more than 1 500 employees, although it is also used in undertakings of smaller size. It must be stressed that this is the only profession where the title Engineer is not protected in France.
The other titles are the same as the ones mentioned in relation to the AFTIM sample discussed in chapter 1. The RENAULT Motor Company uses yet another title called "Working Conditions Engineer" as a substitute to "Safety Engineer" which has been used until the introduction of the HSWCC law of 1982, (PORTEAUX 1985 Personal communication). The change seems to take place in the same sense as the one provided for in the recent legislation related to the workers committees and discussed in chapter 6, but no specific training is provided yet.

8.1.1.3 NATURE OF THE ROLE OF THE HSS

It was mentioned that the HSSs interviewed in the pilot study described their roles as advisers of management and workers and no one claimed to do things himself.
Of the 66 responses 45 (68 %) indicated that they were advisers. Some of the HSSs (22 %) saw themselves as both advisers and doers, and only (10 %) declared that their roles were mainly as doers.

The overall picture of the sample on which the following discussion will be based is that it is a sample of serving HSSs employed in undertakings of various sizes and acting as advisers to both management and workers on matters related to health and safety. The following section will highlight the content of the role of the HSS.

8.1.2. THE CONTENT OF THE ROLE OF THE HSS

The histogram in figure 8.1 was constructed using the mean score for each item, as marked by the HSSs. The 51 items are reported on the horizontal axis and the mean score on the vertical axis. The horizontal axis is further divided according to the elements A to G of the input-output model as dicussed in chapter 7.

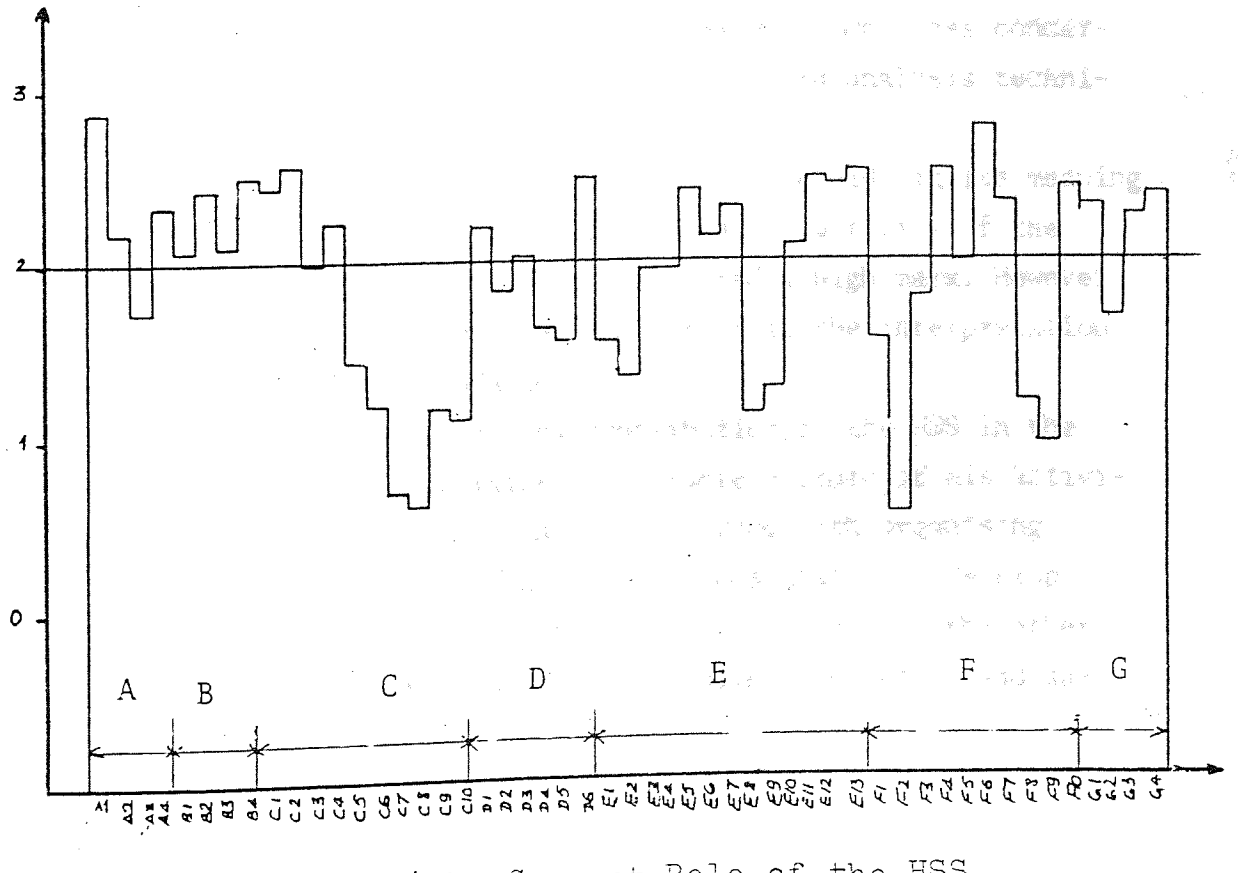

Figure 8.1 The Current Role of the HSS

The histogram descriges the current profile of the role of the HSS as given by the analysis of the sample of the HSSs' responses. The shape of the histogram is irregular and therefore the first indication is that the current role does not correspond entirely to the profile presented by the 51 items of the questionnaire. Some of the items were always part of the job of the HSS, some were frequently part of it, some were seldom part of it and some were never part of it.

Assuming that the highest mean value scored by any one item within on particular phase of the model represents the predominant task(s) of the HSS in that particular phase, the histogram gives a picture of the predominant tasks of the HSS. Clearly the HSS is widely involved in the prevention of accidents (A1) as opposed to the other domains listed in the questionnaire, occupational diseases (A2), material damage (A3) and fire prevention (A4).

In phase (B), stage of intervention, the marks are all relatively high for the four items of this phase. Therefore the HSS reck ons he is involved at both the design stage and during the functioning of the process. However his involvement is rather concerned with the development of safety rules as opposed to overseeing the maintenance of the installations, equipment and safety features.

In the activity of perception of danger, phase (C), the HSS is more concerned with inspection of work place, investigation of accidents and drawing up of accidents statistics. He is very much less concerned with perception of danger through use of hazard analysis techniques and non destructive testing for example.

Item (D1), analysis of causes of accidents was too wide in its meaning and as such it cannot be used to characterize the activity of the HSS in the analysis phase (D), though it scored a high mark. However the highest mark was scored by item (D6) which is the interpretation of the health and safety regulations.

The marks related to phase (E), the contribution of the HSS in the choice of solution, reveal a rather deplorable picture of his activity in this domain. Indeed he is mainly concerned with organising workers trainings, and calling in external consultants to develop solutions and carry out training for the organisation. On the other hand he is again very much involved in composing the health and sa-

fety rules. He is also involved in the choice of personal protective equipment and in explaining to workers and management their respective duties in health and safety.
In order to implement a solution of prevention, the HSS seems to rely heavily on ensuring the compliance of the safety rules and regulations. He also takes part in the HSWCC meetings to get support and approval of his projects and activity, in addition to the reasons mentioned earlier in connection with these meetings.
Again in the monitoring activity his tasks are putting into effect the improvement notices of the controleurs of the CRAMs and the labour inspectors, and also monitoring of compliance with the rules and regulations. The checking of atmospheric concentrations scored the lowest mark in this monitoring phase.

The overall picture of the role of the HSS described so far, confirms most of the remarks mentioned in the introduction and in the pilot study in connection with the current role of the HSS.

These findings indicate that the current role of the HSS is concentrated around tasks which are related to legislation in terms of its interpretation and explaining to management their duties. His action goes mainly towards changing peoples' behaviour and beliefs. He is concerned with persuading management of the need and value of prevention and also with composing and writing the safety rules and monitoring compliance with them.

In terms of technical tasks he limits himself to organising them for the undertaking and calling in external experts to carry them out. His own actions in this domain are very superficial and do not require a thorough training in health and safety, though they require a good understanding of the work place and its organisation and an ability in human relations to facilitate communication and contacts. This aspect has, in fact, been mentioned and insisted upon by the HSSs themselves on several occasions during the interviews.

Two reasons may be put forward :

- The HSS was chosen for a profession that he would not

necessarily have chosen by himself. He was assigned a wide and complexe domain of activity with vertually no job specification. He has therefor composed his activity according to his own background training and experience. He chooses the tasks which are within his competence.

- The HSS was recruited as an adviser to the employer, a role which he still holds to, and as such this role was very much influenced by the legal responsibility of the employer. Hence it was (and still is) mainly concerned with interpretation of the regulations and the monitoring of compliance with them.

The first reason was partly explained in the introductory chapter but it still needs further research specifically concentrated on the HSSs graduates of the I.U.Ts. to see if their choice of the profession and their university training influence their role in a different manner. This was not done in this survey for the reasons already explained.

The second reason is a straight forward conclusion drawn from the indications of the survey. There is no other bibliographic source in France to support it and the sample of the HSSs in the survey being relatively limited, it also needs further specific investigation.

8.2. THE ROLE OF THE HSS AS EXPECTED BY THE OTHER ACTORS

Similar histograms were constructed for each category of the population. Super_imposition of each of these histograms on the histogram of figure 8.1 allows a comparison between the current role of the HSS and the role expected of him by every category of actors. This exercise has to be carried out five times to cover all the five categories of actors and then a further ten times to make a comparison between pairs of categories of actors.
One trial was made, but it proved lengthy and confusing especially as it had to be repeated so many times. In addition it was difficult to show a clear picture of the role of the HSS as expected by the five populations of actors taken together.

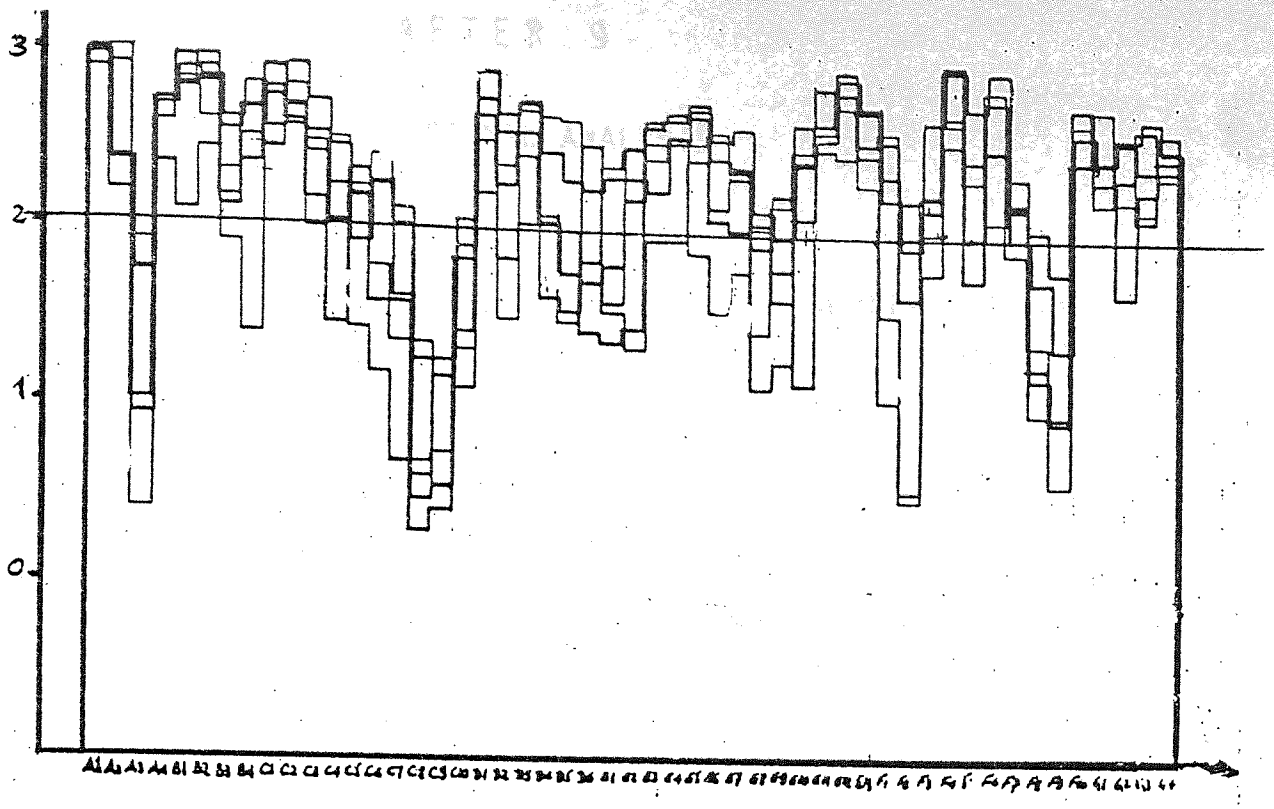

Figure 32 Superimposition of histograms

For these reasons, it was decided to use multidimensional analysis for the interpretation of the data related to the other actors. The usefulness of these methods in connection with this work will be discussed in the following chapter.

CHAPTER 9

MULTIDIMENSIONAL ANALYSIS

The mathematics unerlying each of the methods used in this analysis are beyond the scope of the study. A succinct description of each of them is given in appendix 7, in order to facilitate comprehension of the use of these methods to the reader non familiar with these methods. A computer was used to process the data, and again only graphs of synthesis will be included in the text in order not to disrupt the flow of the argument. The details are largely contained in the appendix.

9.1. PRINCIPAL COMPONENT ANALYSIS

The survey covered 218 respondents, each of whom is individually characterized by 51 variables (the 51 items presented in the questionnaire). Each item provided 4 possibilities of reply. This method will give a first global picture of the results of the survey. It will highlight possible connections, similarities and tendencies and also posible differences between variables, variables and catégories of actors, and between different categories of actors. The variables will appear under their original symbols (A_1, A_2, to G_4) and the actors will appear in the following order :

1 to 62	Health and Safety Specialists
63 to 114	Industrial Physicians
115 to 144	CRAMs Engineers
145 to 179	Labour Inspectors
180 to 199	IUT Lecturers
200 to 218	Employers

Table9.1 shows the natural values (valeurs propres) and the percentages of variance (pourcentages de variance) for each of the 51 items included in the questionnaire. It can be seen that the first percentages are not very high. This is due to the fact that the dimensions of the table of the raw data are relatively large (218 individuals X 51 variables). As such the first four natural values were selected giving 38 % of the

LES VALEURS PROPRES VAL(1) = 11.19098

NUM	ITER	VAL PROPRE	POURCENT	CUMUL	*	HISTOGRAMME DES VALEURS PROPRES DE LA MATRICE
1	0	11.19098	21.942	21.942	*	***************!***************!***************!***************
2	0	3.25644	6.385	28.327	*	****************!**
3	1	2.89637	5.679	34.006	*	****************!*
4	1	2.32992	4.568	38.575	*	*************
5	1	2.13644	4.189	42.763	*	************
6	0	1.65262	3.240	46.004	*	**********
7	1	1.49713	2.935	48.939	*	*********
8	1	1.41221	2.769	51.708	*	*********
9	2	1.35138	2.650	54.358	*	********
10	1	1.29447	2.538	56.896	*	********
11	1	1.21990	2.392	59.288	*	********
12	2	1.16414	2.283	61.570	*	*******
13	1	1.11725	2.191	63.761	*	*******
14	1	1.04540	2.050	65.811	*	*******
15	1	0.98066	1.923	67.733	*	******
16	1	0.90676	1.778	69.511	*	******
17	2	0.88318	1.732	71.243	*	******
18	2	0.84000	1.647	72.890	*	******
19	1	0.80048	1.570	74.459	*	*****
20	1	0.76813	1.506	75.965	*	*****
21	1	0.71853	1.409	77.374	*	*****
22	1	0.71041	1.393	78.767	*	*****
23	1	0.65804	1.290	80.057	*	*****
24	1	0.62435	1.225	81.282	*	****
25	2	0.60586	1.188	82.470	*	****
26	2	0.59805	1.173	83.643	*	****
27	3	0.58123	1.140	84.732	*	****
28	2	0.54561	1.070	85.852	*	****
29	2	0.52154	1.023	86.875	*	****
30	1	0.48154	0.944	87.819	*	****
31	3	0.46071	0.903	88.722	*	***
32	4	0.45160	0.885	89.608	*	***
33	3	0.43168	0.846	90.454	*	***
34	4	0.40357	0.791	91.245	*	***
35	2	0.38807	0.762	92.008	*	***
36	4	0.38503	0.755	92.763	*	***
37	2	0.36258	0.711	93.474	*	***
38	2	0.33913	0.665	94.139	*	***
39	3	0.31699	0.622	94.760	*	***
40	2	0.30826	0.604	95.365	*	***
41	2	0.28855	0.566	95.931	*	***
42	2	0.27363	0.537	96.467	*	**
43	2	0.25255	0.495	96.962	*	**
44	1	0.2475[illegible]	0.485	97.448	*	**
45	3	0.22532	0.442	97.889	*	**
46	2	0.20863	0.409	98.298	*	**
47	2	0.19842	0.389	98.687	*	**
48	3	0.18065	0.354	99.042	*	**
49	2	0.171[illegible]	0.335	99.377	*	**
50	1	0.16777	0.329	99.706	*	**
51	4	0.15034	0.294	100.000	*	**

Table 9.1 : Variance percentages and natural values.

total variance. This will allow the computation of the coordinates of every respondent from 001 to 218, and of every variable from A_1 to G_4. The results are shown in tables 4 and 5 of the appendix. Considering that the principal component analysis was carried out to get the first global picture, only the first two axes are retained.

The first step in the analysis is to try to give a meaning to each of these axes. This is determined essentially by the variables or the individuals from the actors who make the high contributions to the axis in question. Table 4 of the appendix indicates that the individuals included in the interval 001 to 062 (the HSSs) make the largest contributions towards the horizontal axis. Furthermore they are all more or less situated on the same side of this axis (see figure 1 overleaf). This axis could be taken to show the existence of difference between the profile of the role of the HSS as described by himself, which is his current activity and the profile of his role as expected of him by the other actors. However the position of the other categories of actors shows that this expected profile is not necessarily the same to all categories of actors. In fact it will be shown that though there are some similarities, there are also large differences between the different categories in the way each of them expects the role of the HSS to be.

The circle of correlation of figure 2, shows that almost all the variables are on one side with respect to the origin of the axes. This indicates that all the variables are positively correlated between each other. This indicates that the difference between the current role of the HSS and the role expected of him takes place with respect to the majority of the variables presented in the questionnaire.
The interpretation of the results with respect to the vertical axis tends to corroborate the conclusions made, so far, with respect to the horizontal axis. Besides, on this axis the individuals included in the interval 115 to 144 are concentrated in one area making a difference of conception of the role of the HSS, as a opposed to that of the other categories of actors, and notably with respect to the category of the HSSs themselves. This will be shown in detail in later sections.
This overall situation led to the question of possible discrimination of the six categories of actors.

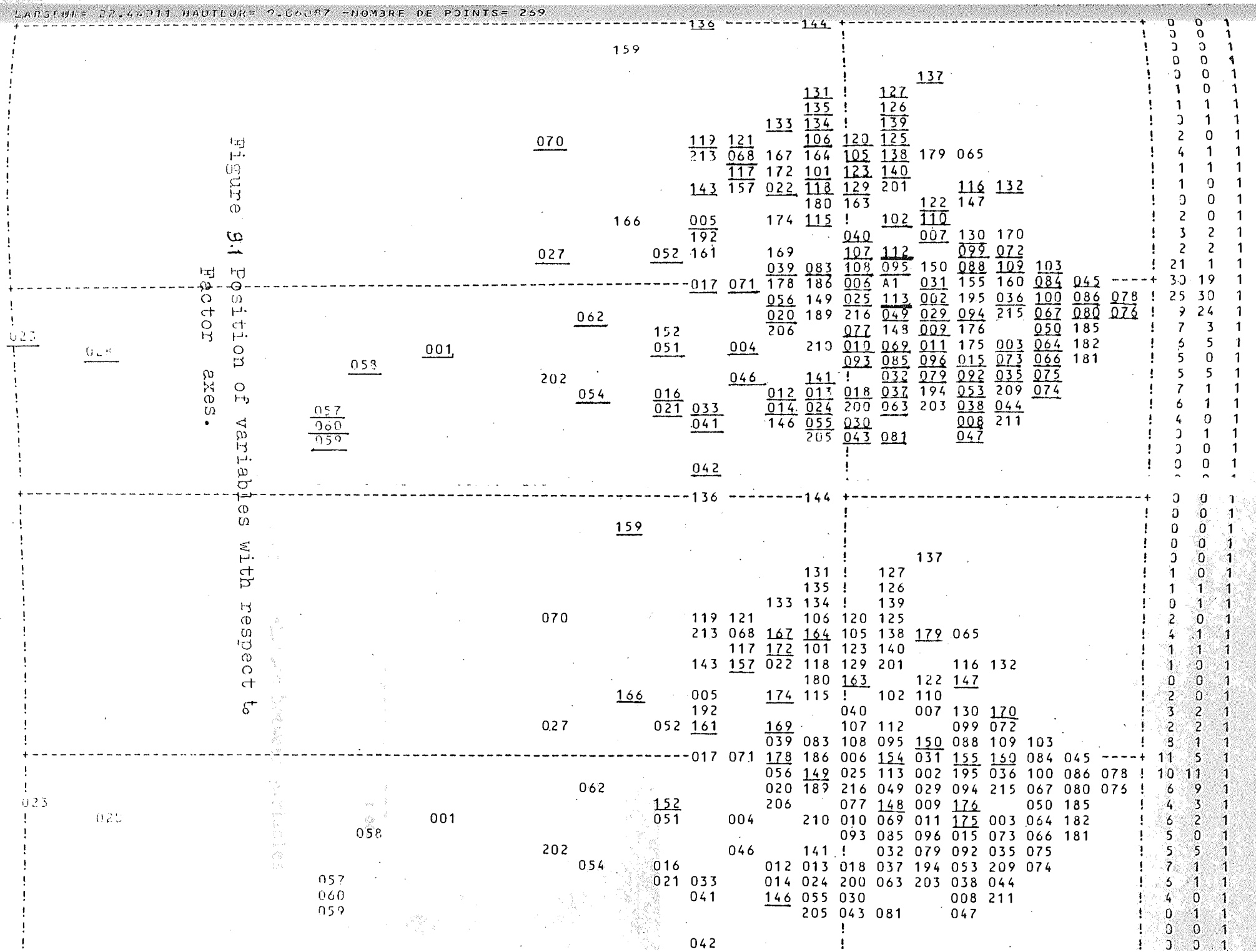

Figure 9.1 Position of variables with respect to Factor axes.

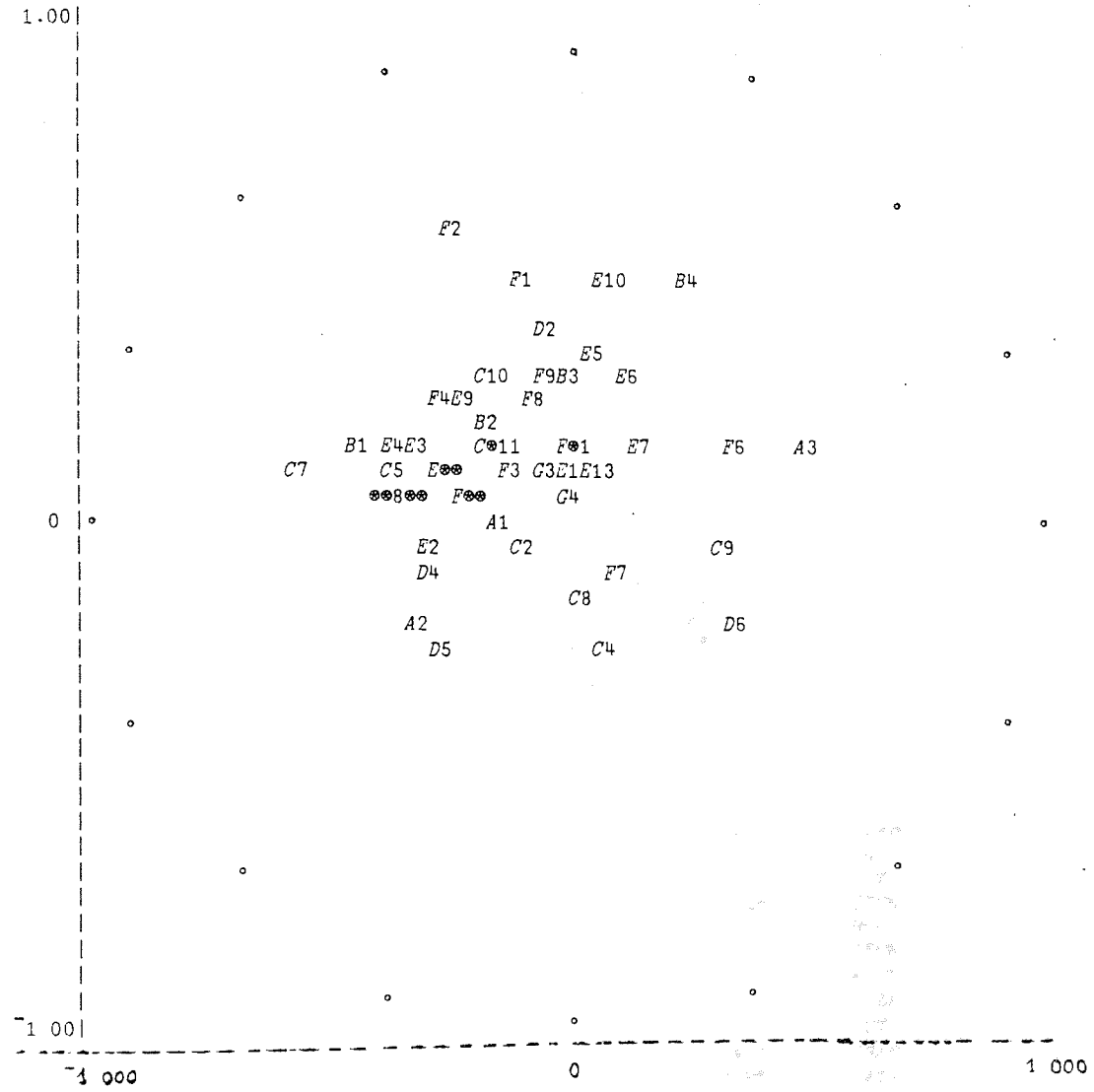

Figure 2. Circle of correlation between variables

9.2. DISCRIMINANT ANALYSIS

The first test was carried through comparaison of the square of the distances between respective centres' of gravity of the six categories of actors (method of HOTELLING). The results are shown on table 7 in the appendix. Table 2 shows that 80.7 % of the respondents were allocated to their own category. There are 53 HSSs, for example, whose responses reflected the same tendencies, therefore the HSSs are indentified within this group. The figure of 80.7 % was rather too ideal (PAGES 1985 Personal communication). This is because of the large number of variables.

AFFECTATION DES INDIVIDUS AUX GROUPES DANS TOUT L'ESPACE

LES DISTANCES AUX CENTRES DE GRAVITE DES GROUPES SONT CALCULEES AU SENS DE W⁻¹

A PRIORI → \ AFFECTATION →	TECH	MEDE	CRAM	INSP	IUT	PATR	
TECH	53	1	0	1	2	5	62
MEDE	0	41	0	5	5	1	52
CRAM	1	0	25	2	1	1	30
INSP	1	4	1	27	1	1	35
IUT	1	1	0	1	16	1	20
PATR	3	1	0	0	1	14	19
	59	48	26	36	26	23	

o/o DE BIEN CLASSES .807

INDIVIDUS MAL CLASSES

	A PRIORI	AFFECTATION
3	TECH	PATR
22	TECH	PATR
25	TECH	IUT
32	TECH	IUT
36	TECH	INSP
47	TECH	PATR
49	TECH	PATR
50	TECH	PATR
62	TECH	MEDE
63	MEDE	IUT
65	MEDE	IUT
66	MEDE	INSP
70	MEDE	INSP
73	MEDE	INSP
81	MEDE	PATR
84	MEDE	IUT
85	MEDE	INSP
87	MEDE	IUT
92	MEDE	IUT
108	MEDE	INSP
115	CRAM	PATR
116	CRAM	INSP
120	CRAM	INSP
123	CRAM	IUT
141	CRAM	TECH
145	INSP	MEDE
146	INSP	TECH
155	INSP	MEDE
160	INSP	MEDE
165	INSP	IUT
174	INSP	CRAM
176	INSP	PATR
178	INSP	MEDE
185	IUT	PATR
186	IUT	MEDE
187	IUT	INSP
189	IUT	TECH
201	PATR	IUT
202	PATR	TECH
209	PATR	TECH
211	PATR	TECH

Table 2. Allocation of individuals considering square distances between centres of gravity of categories.

PAGES suggested a further test of discrimination which was more rigorous known as the test of JACKNIFE. This test reduced the figure of individuals belonging to their respective groups to 57.8 %. This figure was considered very reasonable and certainly not due to any hazard or random distribution (PAGES 1985, and DUTUIT 1985 personal communication). The allocation of the individuals is as shown in table 3.

DESIREZ VOUS REALISER LES AFFECTATIONS AU SENS DU JACKNIFE ?
Oui

AFFECTATION SUIVANT LA TECHNIQUE DU JACKNIFE

A PRIORI → / *AFFECTATION* ↓	*TECH*	*MEDE*	*CRAM*	*INSP*	*IUT*	*PATR*	
TECH	45	4	0	2	5	6	62
MEDE	2	27	2	7	7	7	52
CRAM	1	1	19	5	3	1	30
INSP	1	9	3	18	2	2	35
IUT	1	3	1	1	10	4	20
PATR	5	3	0	2	2	7	19
	55	47	25	35	29	27	

o/o DE BIEN CLASSES .578

INDIVIDUS MAL CLASSES

	A PRIORI	*AFFECTATION*			
3	*TECH*	*PATR*	68	*MEDE*	*CRAM*
7	*TECH*	*IUT*	70	*MEDE*	*INSP*
11	*TECH*	*MEDE*	71	*MEDE*	*PATR*
22	*TECH*	*PATR*	73	*MEDE*	*INSP*
25	*TECH*	*IUT*	80	*MEDE*	*IUT*
32	*TECH*	*MEDE*	81	*MEDE*	*PATR*
35	*TECH*	*IUT*	83	*MEDE*	*IUT*
36	*TECH*	*INSP*	84	*MEDE*	*IUT*
39	*TECH*	*IUT*	85	*MEDE*	*INSP*
42	*TECH*	*MEDE*	87	*MEDE*	*IUT*
45	*TECH*	*PATR*	91	*MEDE*	*INSP*
47	*TECH*	*PATR*	92	*MEDE*	*IUT*
49	*TECH*	*PATR*	93	*MEDE*	*TECH*
50	*TECH*	*PATR*	95	*MEDE*	*PATR*
56	*TECH*	*INSP*	96	*MEDE*	*INSP*
58	*TECH*	*IUT*	100	*MEDE*	*PATR*
62	*TECH*	*MEDE*	101	*MEDE*	*PATR*
63	*MEDE*	*IUT*	102	*MEDE*	*INSP*
65	*MEDE*	*IUT*	105	*MEDE*	*PATR*
66	*MEDE*	*INSP*			

Table 3. Allocation of individuals to the various categories of actors through the method of Jacknife.

It can be seen that both methods, not only allocate the individuals to the various categories, but in addition they indentify exactly to which individual category as individual from the HSSs, for example, was allocated, so long as he is not within his own category. Individual

number 7, for exemple, is a HSS who was indentified in the group of IUT lecturers. Unfortunately the questionnaire was anonymous and therefore there was no possibility to trace other characteristics of the individual in order to explain the reason he responded this way. From a speculative point of view, one could argue that he might well have been an ex-IUT student who was very much influenced by the course and responded through this influence. Other reasons might be given but they all need further checking.

In essence the discriminant analysis proved that the six categories of actors behaved differently as categories. But there was some homogeneousness within each category. The following analysis will highlight the individual items of the questionnaire upon which there is agreement and disagreement between categories of actors.

9.3. FACTOR ANALYSIS

This method was used to carryout a detailed analysis of the data phase per phase according to the phases of the model and as reproduced on the questionnaire.

9.3.1. DOMAIN OF ACTIVITY

Figure 9.3 shows the results of the analysis related to this phase of the model. the two axes explain 99.1 % of the total variance, 95.2 % of which is explained by the horizontal axis alone. Along this axis item A_2 (prevention of occupational diseases) is oppesed to item A_3 (prevention of material damage). Surely the first is concerned with the health of people and the second is concerned with loss prevention in terms of hardware and production only.

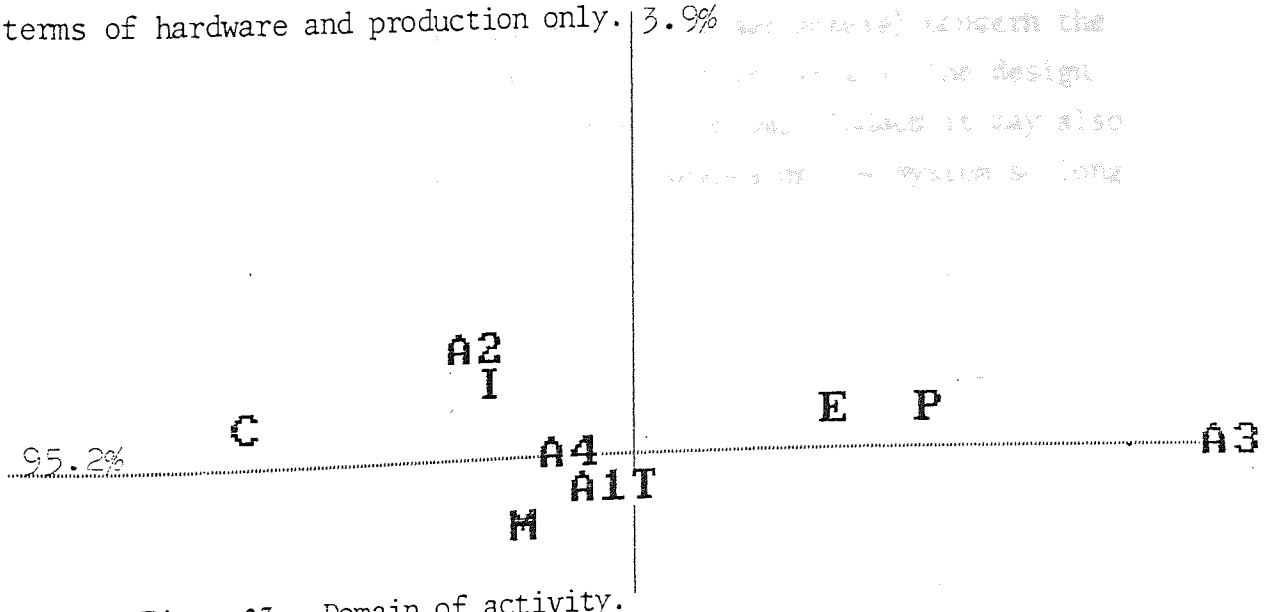

Figure 9.3 . Domain of activity.

The position of the employers (P) with respect to A_3 is not surprising as loss prevention is always their main concern. The position of the CRAMs (C) with respect to A_2 is also evident as their concern is to minimize the amount of compensation due to occupational diseases contracted by employees ; they are not concerned by hardware and material losses as this is the domain of other insurance compa_nies. The position of the HSSs (T) with respect to A_1 (prevention of accidents) and A_4 (fire prevention) is an indication of the domains of activities they are currently involved in. The industrial physicians (M) reckon that these two domains must always be part of the activities of the HSS. However they are less favourable than the inspectors (I) when it comes to including prevention of occupational diseases in the HSS domain of activity.
The position of the IUT lecturers (E) is somewhat intermediate, probably because the course syllabus includes all the four aspects.

Some of these comments will further be considered in much more detail as a link may be established between specific tasks listed in the questionnaire and the domain to which they belong. Crosschecking of the interpretations is carried out systematically both to support the arguments even further and also to explain the contradictions which might arise from one step to another in the analysis.

9.3.2. STAGE OF INTERVENTION

In this phase (B), the four questions were designed to locate the stage of intervention of the HSS. They actually answer the questions where and when in relation to the man-machine system. Indeed the action of the HSS may (or ought to according to the other actors) concern the machine and/or the man. It may (or ought to) take place at the design stage and/or during the functionning of the process. Indeed it may also take place at both stages and on all the elements of the system so long as it concerns its safety.

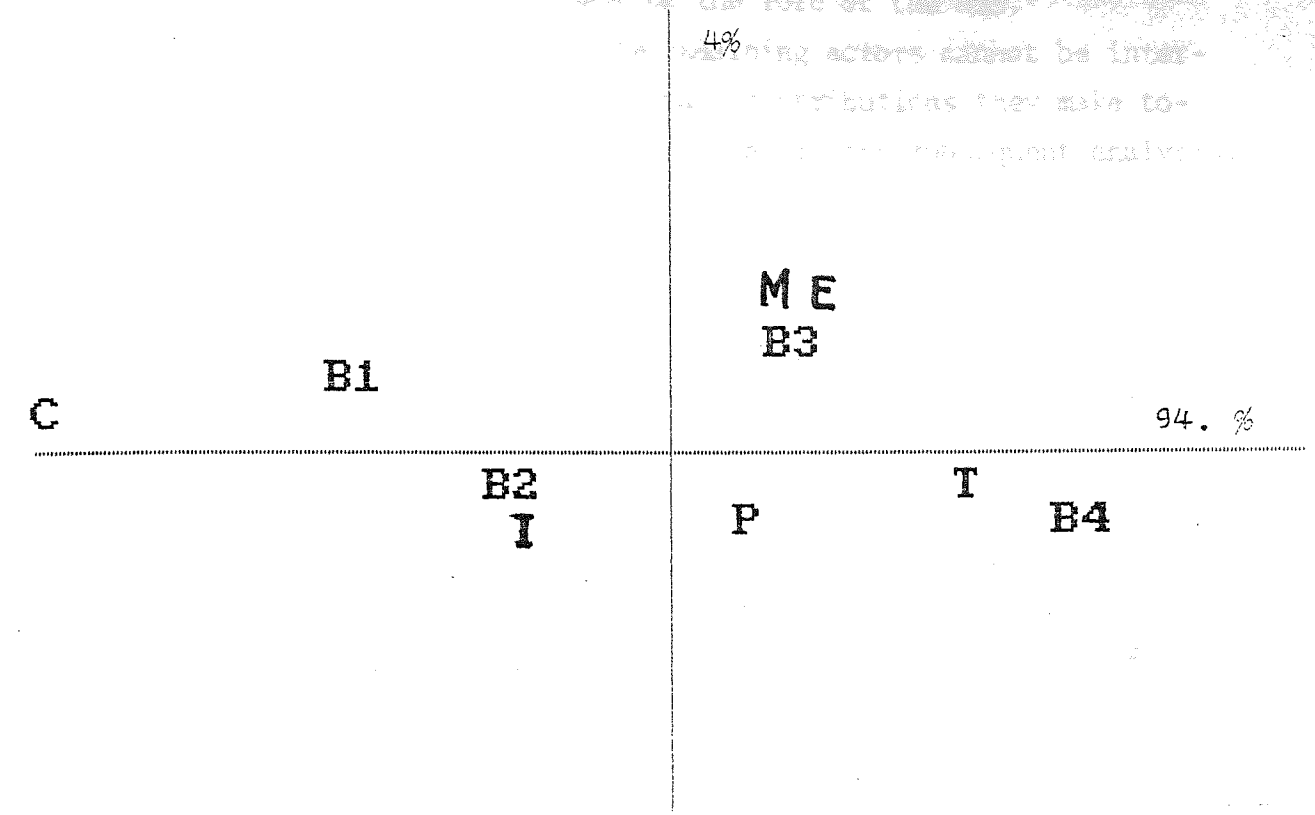

Figure 94. Stage of intervention.

The axes of figure 94 show 98.8 % of the total variance, 94 % of which being explained solely by the horizontal axis. This axis is characterized by (B_1) which is the contribution of the HSS at the design stage of plant and equipment, and also by (B_4) which is the development of safety rules. Therefore at one end it expresses the concept of integral safety requiring an action at the disign stage of equipment, plant and machinery whereas at the other end it expresses action on human behaviour through safety rules.

The vertical axis is determined by (B_3), overseeing of plant and machinery maintenance and by (B_4). Again these two actions are of a different nature. They may both take place during the functionning of the process but one is action on hardware and the other is action on individuals. The position of the HSS (T) with respect to (B_4) confirms the findings of the pilot study and also those of the preceding chapter, safety rules

are one of the main current activities of the HSS. The position of the CRAMs with respect to the HSSs indicates a complete disagreement on the four issues expressed in this phase of the role of the HSS.
The position of (B_2) and that of the remaining actors cannot be interpreted on this graph because of the small contributions they make towards these two axes. They will be looked at in the subsequent analysis.

9.3.3. PERCEPTION

The items included in this phase cover a wide range of tasks, all of them concerned with the perception of danger. But the nature of each task and the competence it may require to be carried out effectively make the difference from one task to another. The object is to look at depth of intervention in addition to the nature of the task.

The axes of figure 95 show 85.4 % of the variance, 60.9 % belonging to the horizontal axis.

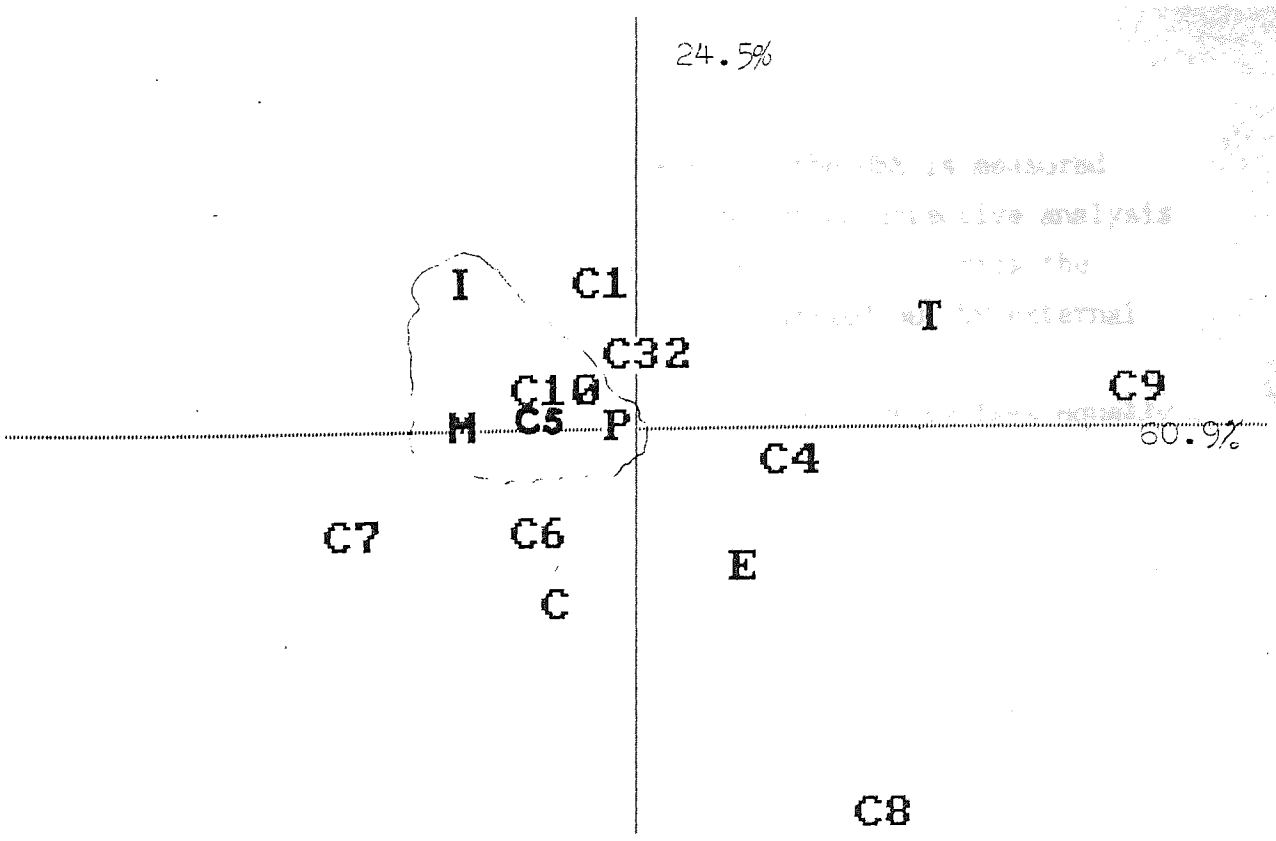

Figure 95. Perception of danger.

The horizontal axis is determined by (C_7), carryingout of technical tasks such as non-destructive testing for example, and (C_9), checking of the workers' fitness. Considering that (C_9) is regarded as the industrial physician's task (see chapter 5), the discrimination is very clear in this case. The vertical axis is determined by (C_1) inspection of work place and (C_8), carrying out audiometry examinations. Again the first task is regarded as the HSS task and the second is the nurse or the physician's task. The position of (C_5), carrying out of hazard and operability studies, and (C_6), carrying out of atmospheric sampling and also (C_{10}) taking part in the preparation of inspection and maintenance operations, with respect to (C_7) and also with respect to the horizontal axis confirm the fact that all of them are tasks of the same nature and interpreted as such by the whole population. They are all tasks requiring some technical knowledge and competence. The position of the HSSs with respect to these items confirms the findings of the pilot study and also those of the preceding chapter. The HSS is seldom involved in these sort of tasks compared to his involvement in drawing up accidents and occupational diseases statistics (C_4) and in organising audiometry examination (C_8).

9.3.4. ANALYSIS OF DANGER

In this phase also, the depth of involvement of the HSS is measured with the nature of the task required to carry out an effective analysis of danger. It also seeks information on wether the HSS carries the task himself or merely organises for it to be carried out by external experts.

The axes of figure 96 explain 96 % of the variance, more or less equally spread between the two axes.

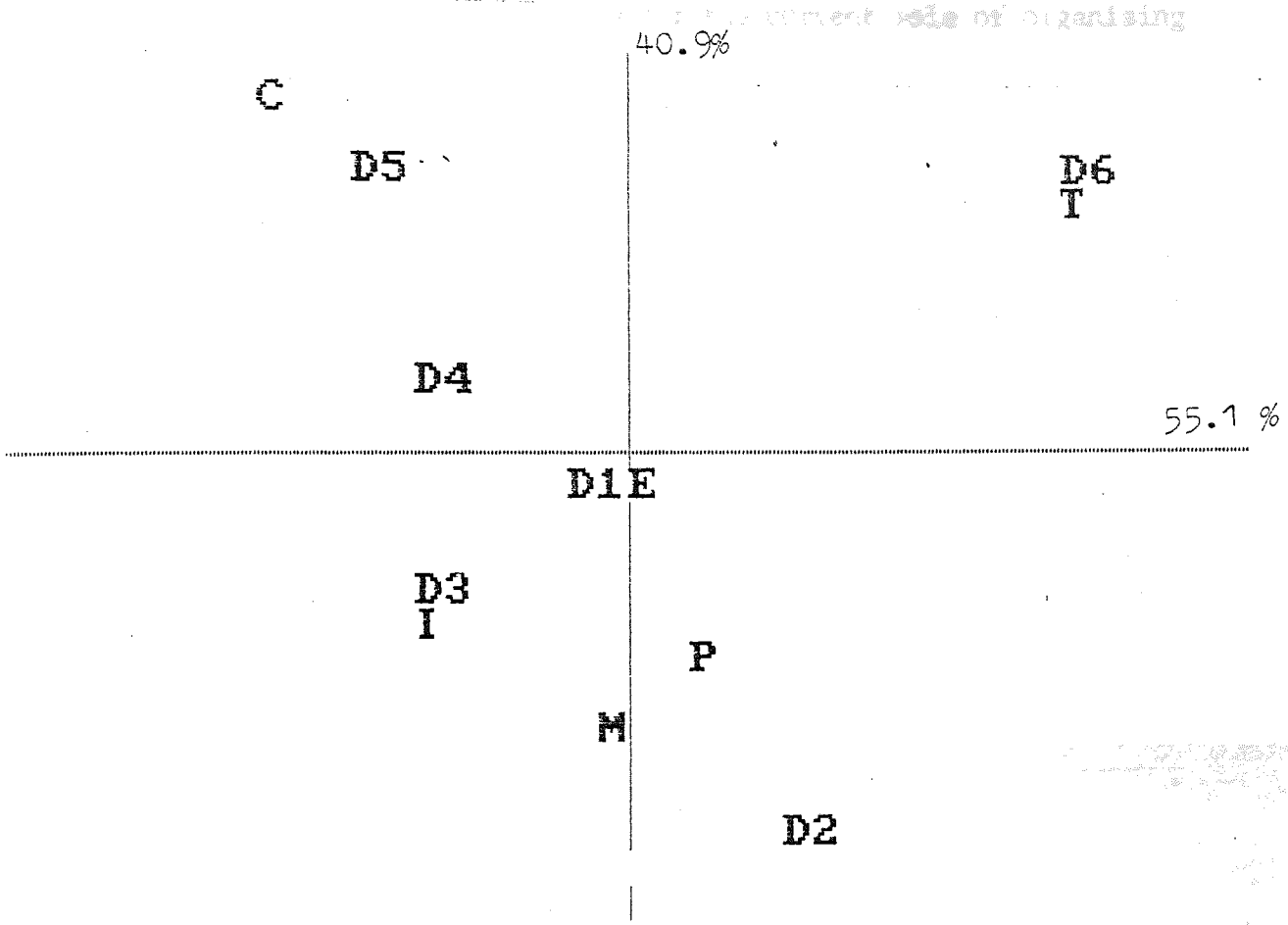

Figure 96. Analysis of danger.

The horizontal axis is determined by (D_2), evaluation of the potential of danger, (D_6), interpretation of the regulations, and by (D_5), calling in external experts.

The position of the HSSs with respect to (D_6) is striking, it confirms once more their deep involvement in the aspects of legislation. The position of the CRAMs with respect to D_5 seems to indicate that they are in favour of the HSS calling in external experts for analysis tasks. This position may be understood by the fact that they are one of the main bodies which claim these tasks to be within their scope of activity (see chapter 4).

Along the vertical axis only the positions of the HSSs, the CRAMs and

the industrial physicians can be interpreted because their contributions towards this axis are relatively important. As such it is clear that the conception of the industrial physicians differs from that of the HSSs and the CRAMs. The industrial physicians expect a role rather technical and more practical, whereas the CRAMs favour the current role of organising things to be carried out by others.

9.3.5. CHOICE OF SOLUTION

The choice of solution is a function of several parameters wich include the state of the art in terms of technical and scientific knowledge, the financial resources available, and also the good will of the employer to choose one solution from a variety of solutions which may be available for one particular problem.
The questionnaire provided a wide range of tasks to be carried out by the HSS in this phase of choice of solution. They cover the technical and financial aspects and require different levels of involvement of the HSS.
The axes of figure9.7 show 79.8 % of the variance, 52.1 % of which belonging to the horizontal axis.

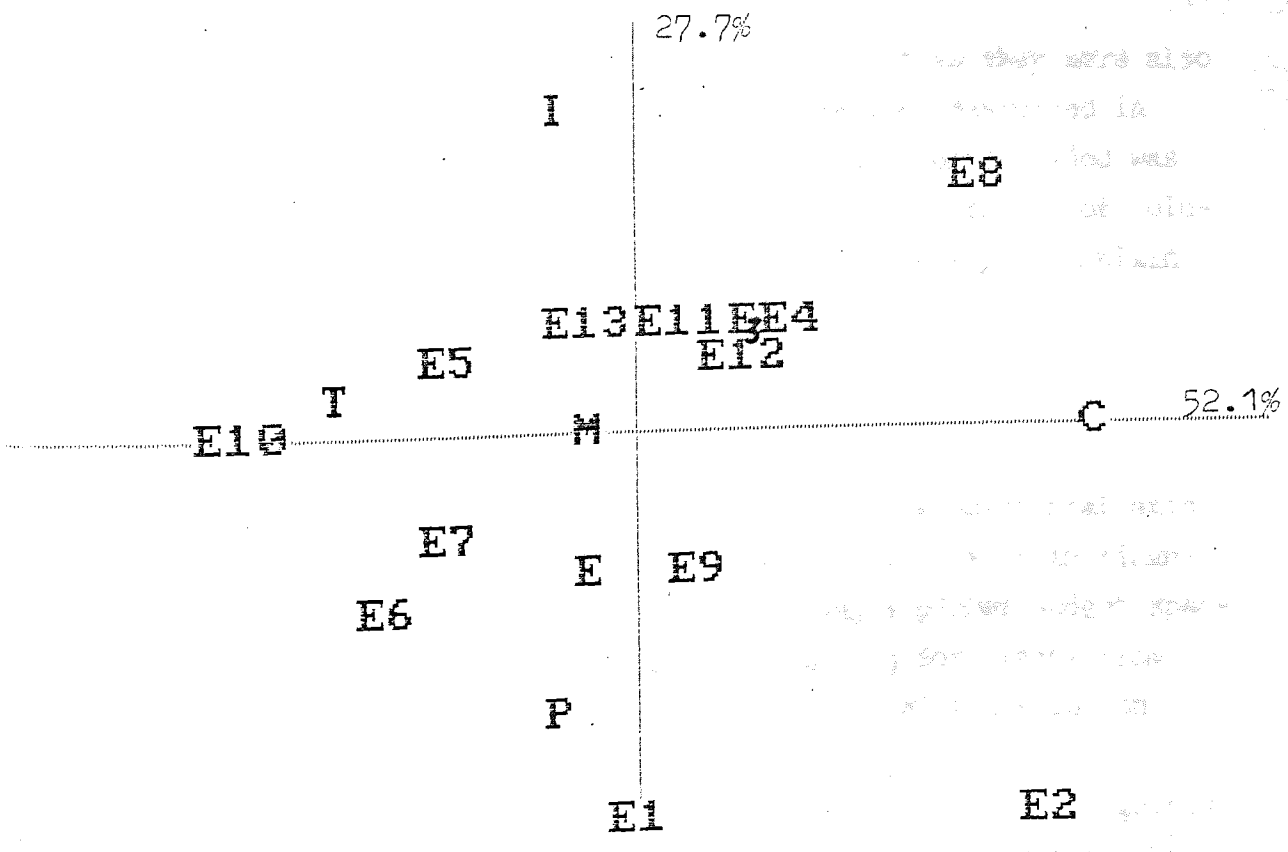

Figure9.7. Choice of solution.

The horizontal axis is defined by E_2, E_8 and E_{10}. The opposition of the items along this axis seems to be established with respect to the nature of involvement. On one side there are activities of advice on various solutions through financial and economic studies (cost/benefit E_2) and also advice on work layout to suit the worker fitness. Both of these activities require knowledge and competence. The CRAMs are the actors who expect these activities.
On the other side of the axis the activity is stopping a work process or machine which presents imminent danger to the worker(s). The HSSs seem to claim this activity within their scope, though as discussed in chapter 6, this action requires written deleguation of power. The legislation gives power to members of the HSWCC to do so and according to LAMAISON there was so far, no effective use of this power.
The vertical axis is defined by E_1, E_2 and E_8. Agin E_1 is related to the study of cost of accidents. There is no evident opposition in terms of nature of action as the three actions are advisory ones. Though E_1 and E_2 are related to finance and E_8 is related to harware. The position of the employers with respect to the financial issues is understandable. It is their main interest. The position of the labour inspectorate is also understandable. They expect the HSS to choose solutions which will correct the harware.
The axes 1 and 3 showed 63.7 % of the information and so they were also projected. The graph confirmed much of the information discussed in connection with axes 1 and 2. The additional information provided was that both the HSSs and the inspectors of labour were in favour of solutions through regulations and safety rules, the HSS having to explain to the employer his duties in health and safety.

9.3.6. IMPLEMENTATION OF SOLUTION

The first two axes show 85.3 % of the information. The horizontal axis is defined by F_1, F_2 and F_7. Again the first two are related to financial means to implement the solution by justifying a proper budget specfied within the organisation (F_1) and/or by applying for grants from the social security funds. F_7 is the implementation of the solution through a specific requirement from the HSS.
The position of the HSSs and the CRAMs with respect to F_7 (see figure 98) is one of the rare cases of agreement between the two categories. The

CRAMs seem to expect the HSS to exert power in the organisation in order to implement the solution. Considering that the HSSs were describing their role as advisers, this response to item F_7 is surprising, as both the current status of the HSS and also from the discussions during the interviews the HSS were trying to show that their efficiency was hindered by the lack of power within the hierarchy.

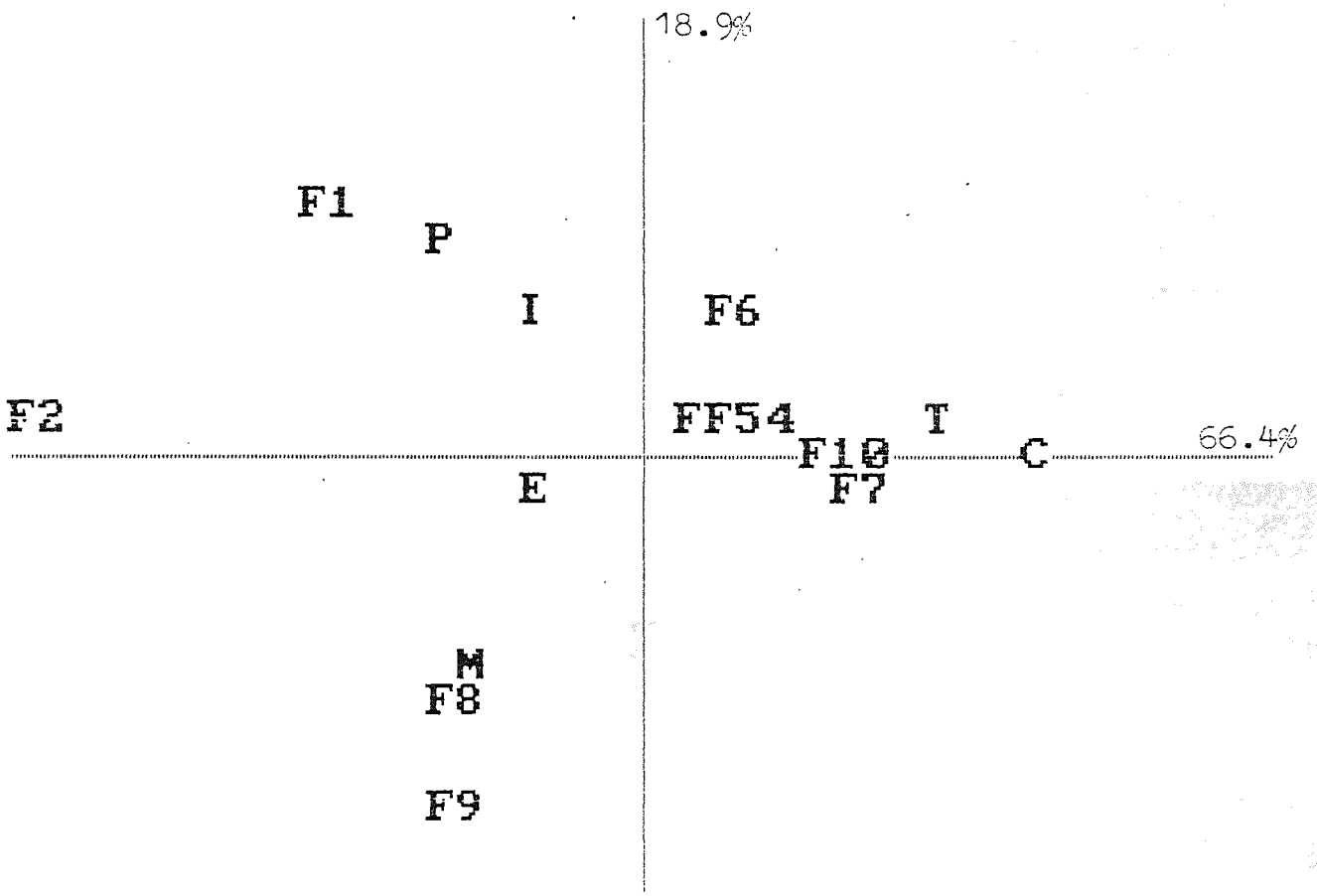

Figure 9.8. Implentation of solution.

The position of the employers with respect to F_1 is rather encouraging as they seem to expect the HSS to define and require a specific health and safety budget.

The vertical axis is defined by F_1, F_8 and F_9. On one side F_1 is related to finance and on the other side F_8 and F_9 are related to harware, and personnel. The industrial physicians expect the HSS to implement the solution through hardware and personnel. Whereas the inspector of labour like the employers expect the HSS to ask for the right budget to implement his solutions. This a rather encouraging position from the inspector of labour.

9.3.7. MONITORING

The two axes reveal 90 % of the information. The horizontal axis is defined by G_1 and G_2. The first is monitoring the actions taken to satisfy improvement notices issued by the CRAM engineers or the inspectors of labour, the second is monitoring the atmospheric conditions to the specified standards which might be a continuous activity in the indertaking irrespective of the inspector's of labour visit. The expectations of the CRAM in this domain are encouraging as they favour the second issue. Whereas the HSSs seem to confirm their actual involvement to satisfy the requirements of inspector of labour (see figure 9).

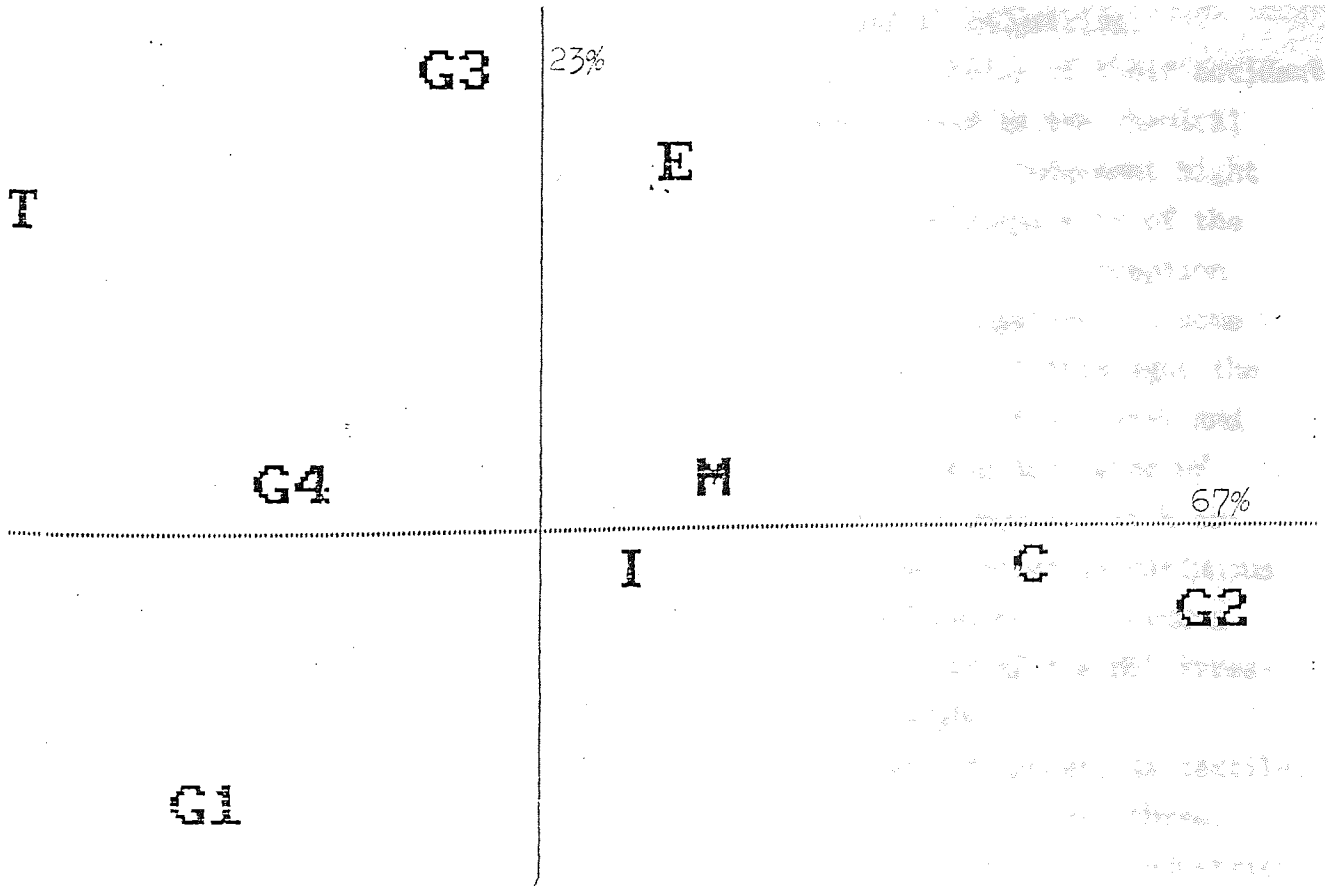

Figure 99: Monitoring.

The vertical axis is defined by G_3 and G_4. Both of which are really related to statutory provisions. Though the safety rules may also be issued by the management in connection with a given safety policy. The inspector of labour obviously expects the HSS to carry into effect the statutory provisions related to training of workers, which is one of their main monitoring activity as discussed in chapter 3. The employers are more concerned about the safety rules.

9.4. FURTHER CHARACTERISTICS

The questionnaire required information on the type of industry the actors expected employment of a full time health and safety specialist, the size of organisation and also whether they expected him to be a doer or an adviser or both (see questions H_1, H_2 and H_3 in appendix 5).

9.4.1. TYPE OF INDUSTRY

The majority of the respondents (80 %) declared that they would expect employment of a HSS in the following industries : Construction and Public Works, Metallurgy and Metal manufacture and Chemical industries.
It is likely that the first two have been judged in terms of their accidents frequency rate (see chapter 2). But the frequency rate in the chemical industries is largely below of these two. Therefore the judgement might have been based on other considerations such as the complexity of the technology involved in this industry and the difficulty of perception of danger which is associated with this industry in comparison to some others. This issue needs further investigation which will highlight the specific need for employment of a HSS in terms of type of industry and associated danger, if indeed this is retained as a good indicator of the need for a HSS as viewed by the various parties concerned with safety and health. This investigation has to be a field study in various industries and it cannot rely on the information given by the various actors, because they hold a global picture of the role of the HSS irrespective of type of industry as was shown in this study.
The remaining 20 % of the sample listed other types of industries textile, printing, and wood working industries in addition to the first three. This group was too small to warrant classification in types of industries

and associated comments and discussion. Overall all the actors expected employment of a HSS in the three first industries mentioned. The IUT lecturers declared that they would expect a HSS in all types of industrial activities in addition to the three already mentioned. But it is likely that the main underlying reason of this statement is employment of IUT graduates and survival of the course ; although the number of applicants to these courses is, so far, extremely high as shown in the first chapter. None of the actors mentioned industries involving automation and the use of computers, for example, and their effect on the nature of job of the workers and also the new dangers associated with the introduction of new technology in general.

9.4.2. SIZE OF ORGANISATION

The size of organisation frequently quoted by the respondents was 300 workers (65 % of the respondents). Few respondents (7 %) quoted a lower figure going down to 50 workers. And the remaining (28 %) quoted very large sizes. Six inspectors, for example, quoted a figure of 1000 workers. The remaining were ranging from 500 to 1000 workers.
Considering that the industries listed by the majority of actors were construction, metallurgy and chemical, the figure of 300 workers seems to reflect the current practice as was indicated in the sample of the HSSs discussed in the provious chapter.

9.4.3. NATURE OF THE ROLE

The nature of the role of the health and safety specialist has never been discussed from the point of view of adviser vs doer (Fonctionnel or Operationnel). Therefore the exact boundary between the two types of nature of the role is difficult to establish. Indeed an exact opposition of the two meanings is difficult to make (DOS SANTOS 1985 personal communication). Nevertheless the basic assumption, indeed the very strong belief, held by various actors is that the HSS should be purely an adviser, (see BOISSELIER 1977). In one of the letters which accompanied the reply, the HSS declared that his role was purely advisory. The declarations during the interviews also revealed this situation. This can also be seen in the main activities currently

carried out by the HSS as discussed so far. In another letter the HSS declared that he considered his role to be advisory whenever he suggested to his employer to take actions in connection with existing dangers in the process, and he was a doer whenever he had to stop the work or the machine because it presented imminent danger. Surely the meaning of doer here is very specific. It certainly requires judgement on the part of the HSS and also knowledge of the situation, but on the other hand it does not imply practical work in the sense of carrying out equipment testing or atmospheric sampling, for example.

From the point of view of the legislation, though there is no status for the HSS, it is understandable to hold the belief that the role should be advisory as the doctrine holds that the employer is the only person legally responsible in health and safety matters of his employees. But in practice this doctrine was streched to the extent that the competence to do anything about health and safety should also lie within management. The lack of adequate training, time and sometimes interest in health and safety does not justify this assumption and belief.

The responses collected in the survey in connection with this issue are given on the graph of figure 9.10 . It can be seen that the majority of the HSSs confirm this belief. Only 20 % reckon that they combine both roles. 40 % saw themselves as only doers but again the meaning of "operationnel" remains to be checked and justified as this is not reflected by the type of activities described throughout the study. The CRAMs hold more or less the same position as the current practice. Again this may well be due to the fact that they are the only group who have the right expertise to carry out practical work in the undertaking which is in turn the way they preserve their own job. The employers do not seem to be likely to change the situation unless their responses are lonly strongly influenced by the doctrine related to their legal duties. The inspectors are not strictly attached to this doctrine and seem to expect a more practical job from the HSS. This is also shown by their responses to the types of activities as discussed earlier. The IUT lecturers seem to expect involvement in both issues, their position is somewhat a consensus between the various actors. This again is typically influenced by the type of the course they are currently running

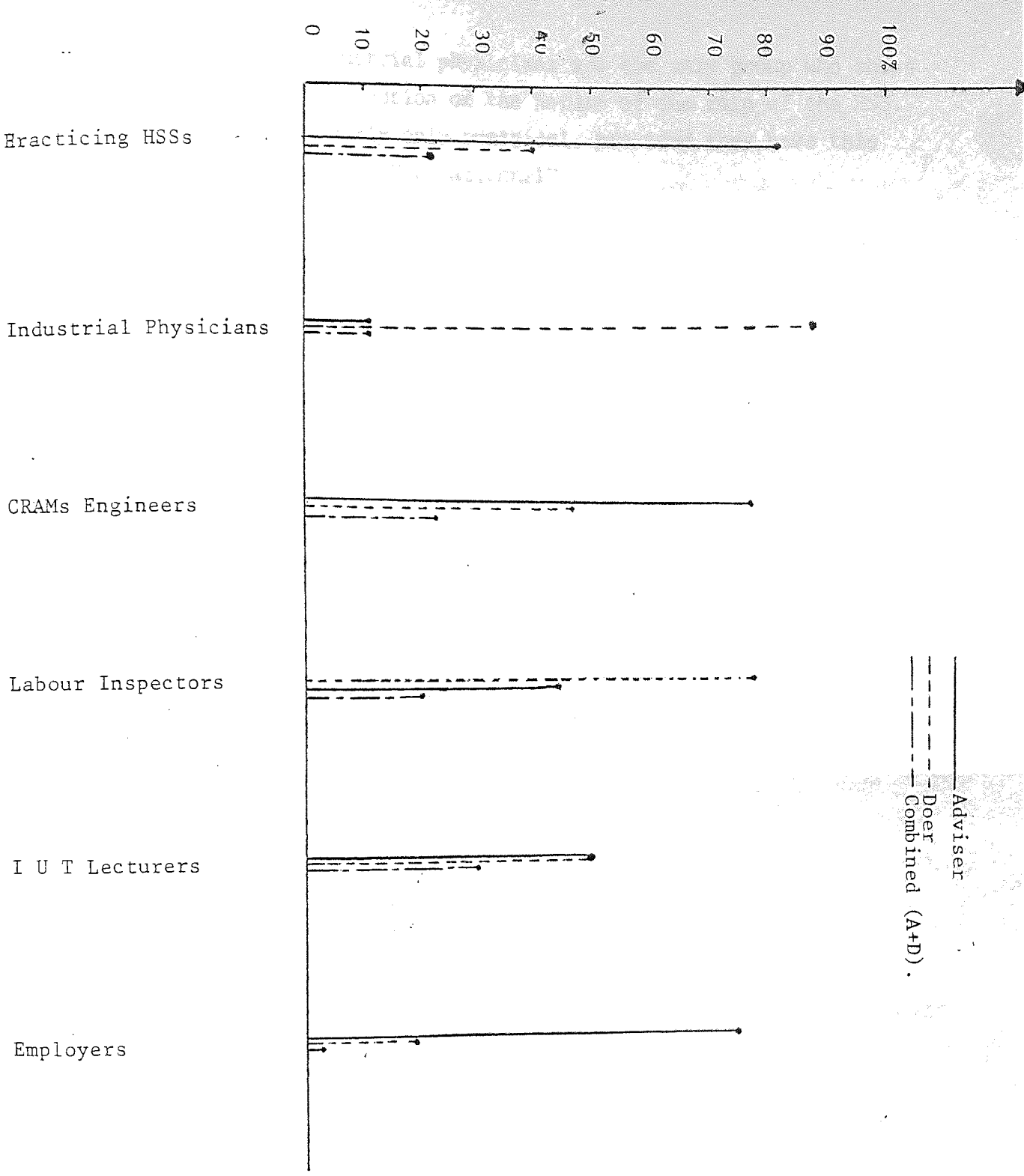

Figure 9.10 Results compiled from the survey to show the nature of the role of the HSS

(see chapter 1). The industrial physicians are the only group who shows a large difference of conception of the nature of the role of the HSS. They expect him to be nearly only practical, provided they have this interpretation of the woord "operationnel".

GENERAL CONCLUSION

Three methods of approach have been used at different stages of study and analysis.
The application of a systems approach to the whole study has proved very useful. It enabled the complex system of the French organisation of safety and health to be analysed in a similar way and in manageable parts (the different institutions). The approach encouraged the quantification of results wherever possible. It enabled important matters to be concentrated upon (efficiency in terms of manpower, time and competence) rather than detailed historical and sociological issues. The input-output model was a convenient framework for the entire study. It suggested its usefulness and flexibility in the study of the activities of the institutions and in the definition of the role of the health and safety specialist. The approach proved that maximising the functional efficiency of a system may not always lead to optimizing its performance with respect to the system it serves. The efficiency of the institutions studied had always been evaluated in terms of their activities but not their effect on the prevention of accidents and occupational diseases in the undertakings they were serving. This approach helped to clarify the shortcomings of their traditional method of evaluation. From this point of view, the study has validated the usefulness of the model for this area of research.

The application of MILLERSON's criteria and obstacles to the development of a profession established the state of the art of the occupation of health and safety specialists in France. It highlighted points of strength and weakness and also the areas which will need improvement for further success.

The survey and the multidimentional analysis were convenient methods of comparison of the current role of the health and safety specialist and his role as expected by the various parties. Figures were used to provide greater clarity.

The study established that the claims of the four groups over the field of health and safety are largely based on their legal status and their historic involvement in the field.

Their roles were originally defined on the basis of complementary action towards the prevention of accidents and occupational diseases, each bringing their specialised competance and expertise.

Concomitant with the expansion of technology, the dangers became more and more difficult to identify and in some cases, were completely unseen. Initially dangers were relatively simple, first related to the machine, then associated with the man-machine interface. The workforce had comparatively little education and consequently many of those dangers which should have been recognised often remain unknown.

However, as changes in technology permeated throughout industrial activity, danger and threats to health became more invidious. In addition, the awareness of society to the potential and real dangers grew as universal education became the norm.

The result was an expansion of the domains of activity within the health and safety field, to the extent that the whole domain of working conditions was included. For example, welfare became a live health and safety issue - and not merely an adjunct to working conditions in general.

Those responsible for legislation found it convenient to utilise the existing traditional groups associated with health and safety (rather than acknowledge their specialised role). In doing so the legislators reinforced these traditional group's claims for supremacy.

The traditional groups, quite understandably, grasped this opportunity to attain dominance in the field of health and safety. In addition, as their dominance grew, the traditional groups interpreted legislation and were involved in consulation prior to the introduction of new legislation - thus effectively placing their interpretation at the policy formation level. Each of these progressive degrees of involvement provided a continuous reinforcement in their strength and position in the field. Ultimately forming the amorphous mass referred to in the introduction and demonstrated throughout this study.

This created a paradox. As the various traditional groups' area of functional responsibility expanded and merged at the perimenters, the

Training". The HSS, largely acting on self-defined role expectations, often reinforced by managers (who had little real understanding or knowledge of the subject), had not anticipated this demand.

The analysis also revealed that the expected role of the proposed intervention group, the HSS, was NOT viewed in the same way by all the other groups. The perspective of the HSS role was influenced by the respondents own role within the undertaking. Each respondent left out any reference to those areas which were considered to be their own area of competance. Respondents seemed reducing both perceived threats to their own role and the possibility of conflict between professional groups. A form of 'limitation of claims to avoid overlapping and rivalry' (ATHERLEY and HALE, 1975).

One advantage of the identification of a problem is that it is the first stage to a solution. This is then made public (CHAABANE 1985). Once identified, informed public debate can take place. The identification of possible areas of conflict between health and safety expert groups is seen as vitally important, since it is the first stage in their resolution.

The responses were also influenced by the respective objectives of the groups. The objectives of the employers, for example, were clearly related to the financial aspects of the subjects hence their tendency towards loss prevention.

A synthesis of many of the points raised can be made by reference to the CRAMS. The CRAMS were interested in the field from the point of view of accidents and diseases which mainly reflects their particular need to reduce compensation charges. In terms of revalries the responses from the CRAMS characterised their total opposition with respect to the majority of items of current activity of the HSS and also with the activities expected of them by the other groups. They are therefore the most powerful rival to the HSS in health and safety. Their responses confirmed the belief and the position held by the representative of the national security funds discussed in Chapter 1. The only apparent matter of agreement was the need for more power for the HSS to implement solutions in the context of the HSS-CRAMS relationship. This could be taken to mean power to be able to organise for external

expertise as mentioned earlier. The CRAM being one of the main expert bodies in question.

The responses of the Labour Inspectors, the industrial physicians and the employers seem to point to activities such as systems analysis (Chapter 5); equipment testing (Chapter 7) and maintenance scheduling and involvement (Chapter 10). These activities belong to the perception phase of the model. They are certainly all based on knowledge and training.

The training needed for these types of activities should really provide skill and competence in order to be able to establish this first diagnostic task. With this skill and given a place within the intervening groups, the HSS could well be the main pivot in this field within his organisation.

He could be the coordinator person binding together the different actions from outside intervening actors. The difficulty with this role will be the competence and knowledge of the other actors to practice as specialists in their respective domains. But this can be solved if indeed their specific and respective domains come to be more closely defined in terms of their respective objectives.

THE FUTURE OF THE HSS

Although the survey tried to find out the role of the HSS as expected by the various parties concerned with the prevention of accidents and occupational diseases, The questionaire did not specify whether it was concerned with the role of the HSS as these parties had always expected it to be or as they would expect it to be in future, taking into account the current transformations in technology , legislation and society. It is appreciated that these transformations will shape the function of the HSS and consequently shape his training too.
However these issues are highly inter-related and each of them is important and wide enough to deserve a separate study which obviously cannot be managed within a section of this size. Therefore the following discussion has no ambition nor any intention to cover them in detail. In addition, the information currently available on the subject can allow no more than speculation in the light of the emerging trends.

INDUSTRIAL AUTOMATION

Renault Moter Company (Regie Renault) is the leader in the making of robots and their use in France. Currently there are about 2500 robots in use in various plants of the Company. Ford Motor Company (a plant of Ford of Europe Group based in Bordeaux) also makes extensive use of robots. Both organisations were visited during the course of the research. The object of the visit was specifically to discover the major changes in their safety organisation which had occured as a result of the introduction of the robots. In both organisations the visit and the discussions took place with the safety engineer of the organisation.

In both cases, the interviewees declared that their organisation were under pressure to improve their productivity, if they wished to continue to exist. Hence the massive introduction of automated production and assembly lines. In Renault, for exemple, it was evaluated that one robot could replace 2.5 workers and it took 2 years to be payed off. The situation, however, created considerable problems of redundancies, and reinstatement of workers, with which the organisations were particularly concerned. Surely this state of affairs is not specifically relevant to these organisations and is in fact a consequence of the industrial automation. It rises, though, a problem of skill and safety training of workers to be reinstated in new jobs. Safety training, particularly, is a legal requirement (see chapter 6), but, apparently it was not taken seriously in these organisations.

There was a general acceptance that safety had improved through the use of robots. Though there was no statistical evidence to support this acceptance. The accident statistics classification does not make the difference between robots and other machinery. The interviewees argued that automation had removed employees from the manufacturing processes and dangerous conditions and turned them from machine operators to set up people and machine monitors.

There are no specific regulations for robots in France and the regulations currently in force are those related to machinery guarding in general (art. R 233.85 to R. 233.106 of the Code of Labour). The types of protection devices used are also similar to the ones already in use for other machines. They are perimeter guards including chains, rails, gates, light curtains, pressure-sensitive mats and key interlocks. The perimeter guarding principle is preferred to other principles because it allows for the multiplicity of actions of the robot and its flexibility. The usefulness and drawbacks in connection with machinery guarding have been discussed elsewhere (see BOOTH 1976). The problem with the robots is that the work area is always so large to house one to many individuals and also the maintenance and repair may require that the power be "on". Therefore performing maintenance may not always be possible. This is one example of shortcomings of engineers in their specialist subject and represents a chalenge to the HSS in the establishment and monitoring of safe work procedures. This is particularly so, when we consider that the most serious potential injury from a robot involves workers being trapped between the robot arm and some other fixed or moving object as demonstrated by the following circumstances of fatalities recorded in Japan.

- " A robot pushed a repair man into a grinding machine. The investigation revealed that the man had climbed over a safety fence. He walked in its working area in violation of established safety precautions.

- A worker climbed on a moving conveyor to retreive a defective part. The robot serving the line was not moving when he did this, but started up when the moving conveyor reached a programmed point. It then moved the the conveyor and squeezed the man to death.

- A worker stepped between the robot and the machine (a planner) it was serving. He turned off the circuit that sent activating signals from the plane to the robot, did what he had to do, but switched on the circuit before getting out of the way. The robot resumed its motion and crushed the man to death against the planner.

- A man started a welding robot in motion while another man was in its workspace. In moving the robot pushed the man into the positioning fixture and killed him".

These cases demonstrate that although engineers have advanced in industrial automation they have not advanced in the safety techniques which should be associated with it. They show a considerable lack of understanding of human behaviour in the face of the automated machinery. The prevention of this type of accidents is within the scope of experts whose training and experience are mainly concerned with behavioural and procedural aspects of engineering. None of the actors reviewed in this thesis had these aspects incorporated in their training and experience. Therefore a substantial involvement of the HSS may be required in these areas.

Automation in the chemical and petrochemical industries has created dangers that are complex and hard to perceive or understand. They are generally controlled by persons other than those who may be harmed and may impact many thousands of people.

Safety in automated installations relies heavily on complexe devices coupled with safety procedures. The success of these measures requires constant implementation, inspection and supervision which none of the actors studied had expertise and time to carry out thoroughly and continuously for the undertaking.

USE OF COMPUTERS

There are two issues in connection with the use of computers in the field of occupational health and safety.

- Looking at the current role of the HSS as revealed throughout the study much of his activities such as compiling of personnel exposure records, retrieval of pieces of regulations, compling and analysis of statistical data, planning and organising of periodic inspection of equipement by external bodies and the associated routine, could readily be performed by computer and in the most reliable way. Many organisations already store personnel and sickness absence on computers. The introduction of computers in occupational health services is facing the problem of confidentiality of medical records but various parties concerned with the subject are already discussing to adopt some sort of code of practice. In the domain of periodic inspections of equipment and machinery, the I.S.A.O. System (Inspection de Securité Assistée par Ordinateur) recently introduced by the S.N.P.E. (Société Nationale des Poudres et Explosifs 1982) is already gaining ground in other industries.
From this point of view, the expected outcome would be that employers wanting to improve the productivity of safety activities will use the computers to carry out these routine tasks and make savings in health and safety personnel costs. Such developments have already taken place in other domains of management and the management of occupational safety and health has no fundamental reason to escape. It could be argued that the field of occupational health and safety makes use of extensive personal judgment. The fact is the current role of the HSS as described in the study, is not particularly marked by the use of judgment and competence. From this point of view the use of computers will be threatening the practicing HSSs ; it may reduce the number and as such it may be considered as an obstacle to professionalisation in occupational health and safety.

- On the other hand the use of computers may well be grasped to develop the profession on other grounds. The use of the computer in such a way as to integrate the competence, judgement and experience of the HSS and the capacity and flexibility of the computer, will provide optimum and successful solutions to problems of safety and health. The use of computers in systems safety analysis is one example of such use. In at least two French Universitues, the University of Compiegne and the I.U.T

of Bordeaux concerted efforts are being made to fhurther this approach and develop software packages.
The expansion of this practice will automatically rise the standards of competence and training of the HSSs, which in turn contribute to settle the profession.

LEGISLATION

The current legislation seeks to further occupational health and safety by specifying employers' duties in the form of general objectives (art. L. 232.1 and L. 233.1 of the Code of Labour and the law of 6 décembre 1976) and by providing for more involvement of employees (Law of 23 December 1982).

The legislation followed either identification of a general danger that caught public notice or of a single disaster drawing public attention to a particular danger. The result was a body of regulations which specify technical hardware to be provided rather than objectives to be achieved. The technical hardware approcach imposed a nett financial burden on employers without having advanced the safety of people at work ; Machinery guards are a typical example. They are expensive and sophisticated but less reliable in their day-to-day functioning. Employers' Committment to safety was assessed by the presence of guards rather than their efficiency. The employers show their investment to reduce their contribution to the social security funds and also to support their grant application from them. The new law makes use of the general objective covered by the expression "safety and Hygiene". The concept of a general employers' duty to satisfy this objectif is certainly a powerful tool to promote health and safety. Cases of heavy fines imposed on employers failing to comply with this duty have been recorded since 1982 (see SEILLAN 1983). The difficulty with this new orientation of the legislation is that it activates some existing concepts and generates new ones. These associated concepts have advantages and disadvantages linked with the interpretation made of them by the employers and the various parties concerned with the prevention of accidents and occupational diseases. These interpretation will have an influence on the role of the health and safety specialist and on the promotion of the profession.

- THE RIGHT OF MANAGEMENT TO MANAGE - this is an old well know doctrine. The employers are responsible for the health and safety of their employees. In large organisations managers act on behalf of the employers in all the domains of magement of the organisation and even more so, in aspects related to health and safety of the employees, as he has a delegation of authority. The employer's responsibility falls entirely on management. The new law does not alter the spirit of this concept, but its activation generates further ideas in connection with health and safety. The use of this concept is sometimes extended to support arguments and beliefs holding that because the legal responsibility lies entirely in management's hands that is also where the competence and expertise should lie. Despite the usefulness of the doctrine, its extension is both naive and dangerous. It is naive because it proves total ignorance of the complexity of the domain of health and safety and the training and competence it requires to achieve significant results in prevention. It is dangerous because aspects of health and safety have never been central to the manager's activities, not necessarily because of lack of awareness about his legal duties but more frequently because he is deeply involved in the other financial aspects which are essential to the survival of the organisation and also because of lack of training and competence in the domain.

INTEGRAL SAFETY : Integrating safety at the design stage of equipment and machinery is one of the objectives of the Law of 6 December 1976. The provisions concerned with machinery guarding are a good example. The necessity of a health and safety specialist in connection with this has been thoroughly argued elsewhere (see BOOTH 1979).
A current extension of this concept is the belief held by the Ministry of Labour as mentioned in the introductory chapter of this thesis. This belief is that "safety should be so integrated into the normal management that there will be no need to speak about it".

This is partly demonstrated by the massive provisions of workers trainings designed to incorporate safe working actions into their normal work actions. This is a step forward in the prevention of accidents, provided it is well perceived and accepted by the workers. It is even more difficult to implement at the management and engineering level because of the conflicting pressures under which these people work. Therefore the concept of integral safety is again a very powerful tool in the preven-

tion of accidents and occupational diseases in the sense that it provides danger control and elimination at the ealiest stage. Nevertheless it must be appreciated that its success relies on expert knowledge and advice from HSSs, themselves accepted and integrated in the working teams at all stages of the process.

SELF - REGULATION : The input-output model set out at the beginning of this work indicates a series of logical steps necessary in order to control danger. Failure at anyone of the stages leads to high probabilities of accident. Phases C(perception) to G (monitoring) form a closed loop. Self-Regulation, could be taken to mean that individuals, groups, departements and organisations carry out this monitoring loop at their respective level (see HALE 1983). HALE defined the role of the factory inspector as the outermost layer of the monitoring process and set out a question of how to know if an organisation is regulating itself ? Surely the current French legislation provides the answer (at least in theory). The duty of the employer to ensure health and safety condition of his employees. Control may be exercised through measures of achievement in terms of absence of accidents and occupational diseases, and elimination of conditions known to produce them. Conscious managers will seek expertise and advice to carry out the monitoring process at all stages of the model.

WORKERS' INVOLVEMENT : Chapter 6 of the thesis. Analysed the provisions given to both the HSWCC and its predecessor. It was clear that the new provisions gave larger power and discretion to members of the committee and also provided facilities for training. As such the HSWCC could reasonably be expected to carry out some of the monotoring process at some stages of the model. Given that they are more familiar with the system and the organisation as whole. Their activity could be more efficient than that of the labour inspector or the social security engineer. However the HSWCC will soon appreciate the need for advice to be able to perform the task adequately. On the other hand if the HSWCC proved to be competent in the monitoring process it will be an internal but very strong pressure on the employer who will in turn seek expertise to correct the system.

CHANGES IN SOCIETY

There are several transformations occuring in the society at large. These transformations are related to the types of activities involving workforce, people's level of education and their awareness about dangers at work. These factors will affect and shape the role of the health and safety specialist in future.

Simple mechanical jobs are steadily being eliminated through the introduction of industrial automation and the use of computers. The remaining jobs in industry will require more complex job knowledge. The employees should assume a more professional status. This in turn will induce pride in themselves and as such will require more competence and knowledge on the part of the HSS to be able to carry out his training and persuasiveness activities, in addition to the skill he will require to deal with automated machinery as suggested earlier.

The reduction of jobs on machinery shifts the workforce to jobs related to services which bring in new dimensions of hazars and dangers. These jobs involve more human relations and interactions. Hence new methods of prevention need to be developed.

High numbers of immigrants are returning to their countries of origin and are replaced by young nationals. This new generation is better educated and financially more secure. They have higher level of job expectations and different values about work ; and also higer level of awareness about dangers at work. This situation will require more reinforcement in terms of understanding particular safety devices or safety procedures. They would require a better identification of safety to their needs in order not to defeat the safety devices or procedures.

The three main transformations pointed out so far (automation, legislation and society) provide apportunities for specialists in health and safety to grasp in order to secure their occupation and further the profession. But they should appreciate that these opportunities require a good deal of effort in terms of training and competence.

THE USEFULNESS OF THE RESEARCH

During the course of the research the author was invited on several occasions to attend the regular meeting of the A.I.T.A.S.A. in order to discuss the preliminary findings of the research and its progress. He was

Furthermore the study established that the system of occupational safety and health in France does not satisfy the objectives it was originally designed for. The study showed also that the institutions concerned with health and safety are in firm control of the situation at national and regional levels and also in the undertakings. The study highlighted the difficulties to evolve the radical new approach about health and safety which is now being introduced through the new legislation.

In Algeria, this kind of institutions are just being developed and the systems are not yet very rigid and are therefore easy to be modified. The recent reform of occupational medicine is a typical example (ONIMET 1984 *). Therefore Algeria has a greater apportunity to develop a system based on a broader and more comprehensive approach.

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* Organisme National Interprofessionnel de Medecine du Travail (Group Health Services) orignally based on the French Law of 1946 was recently dissolved for inadequacy.

APPENDIX I

GENERAL ASPECTS OF FRENCH LEGISLATION

(in occupational safety and health)

This appendix is provided to give a sussinct picture of the pace of development of the French legislation and to identify highlights or land marks. The main characteristics of the basis of French law are also provided.

HISTORY

The events surrounding the early development of the current legislation in occupational safety and health are fairly well documented. A recent review is by SEILLAN (1981).

It was late in the 19th. Century before any effective statutory provision was made in this domain. The development of steam power and its application led to the growth of employment of children in these industries. This in turn brought the general question of regulation and protection of child labour to the fore.

The working conditions in the wool and cotton manufacturing industries were investigated by WILLERME in 1840. He reported in 1840 and recommended government intervention through legislation to protect the health of people at work. Though concern about this problem was expressed earlier (the report read at the MULHOUSE industrial society conference in 1828 quoted a life expectancy of 25 years in 1812 and only 18 years in 1826 and argued that since 1812 corresponded to war time whereas 1826 was a time of peace, life expectancy had been reduced through occupational accidents and diseases, see SEILLAN 1981) the report of WILLERME is considered to be the start of the move in this domain in France. Indeed the law which marks the begining of government intervention in this field was passed on the 22nd of March 1841, about a year after WILLERME had reported. The law concerned the use of child labour and fixed the minimum age limit to 8 years and the maximum working time to 8 hours a day.

SEILLAN considers that this law did not have much effect as there was no means of enforcement (C.f. 1802-1825 in U.K.). It was therefore not until the law of 1874 that an effect could be hoped for, as this law

established the corps of the inspectorate (see chapter 3). This law extended the regulations to the employment of wemen for the first time, but remained strictly concerned with wool and cotton manufacturing industries.

Twenty years later, the law of 2nd. November 1892 extended the duties of the two previous laws to all employers. This law is considered to be base of the current legislation system related to occupational health and safety. The law laid down two series of provisions, both of which are in the current code of labour. The first set is devoted to "Working conditions, rest periods and leave time" which are under titles one and two of book two of the current code. The second set of provisions is devoted to safety and hygiene and forms title three of the same book, of the Code.

This law was ammended several times after 1892 and the final issue is known as the decree of 10th July 1913 and forms the essence of the second part of the current code of labour.

The whole of the statutory provisions from 1913 to the present day are systematically reviewed and gathered in one voulme which is updated every two years (PLUETTE 1982). This book has been used as the reference to trace the evolution of the occupational health and safety legislation in its quantitative aspect for this thesis. The legislation is expressed in two ways : Laws and Decrees. The latter provides for the enforcement of the law. There are also ministerial memorunda which are guidance notices with no real legal power. However, for the purpose of this study they too express government intention and thoughts about the subject at any one time, even though they may not be used to enforce the law.

Over the period, 1913 until today , there have been over 600 texts, half of which are laws and decrees. The diagram[1] shows that the vast majority of these texts are promulgated in the second half of this century. In particular the period just after the second world war marked the establishment of the occupational medicine, the social security funds and their regional branches, and also the health and safety committees. The susequent regulations related to these institutions are also promulgated in the same period. The details of this legislation are appropriately provided in chapters 3,4,5 and 6.

If the number of texts per yaar is a meaningful guide (see figure[1]) it may be said that much attention was first given to health and hygiene

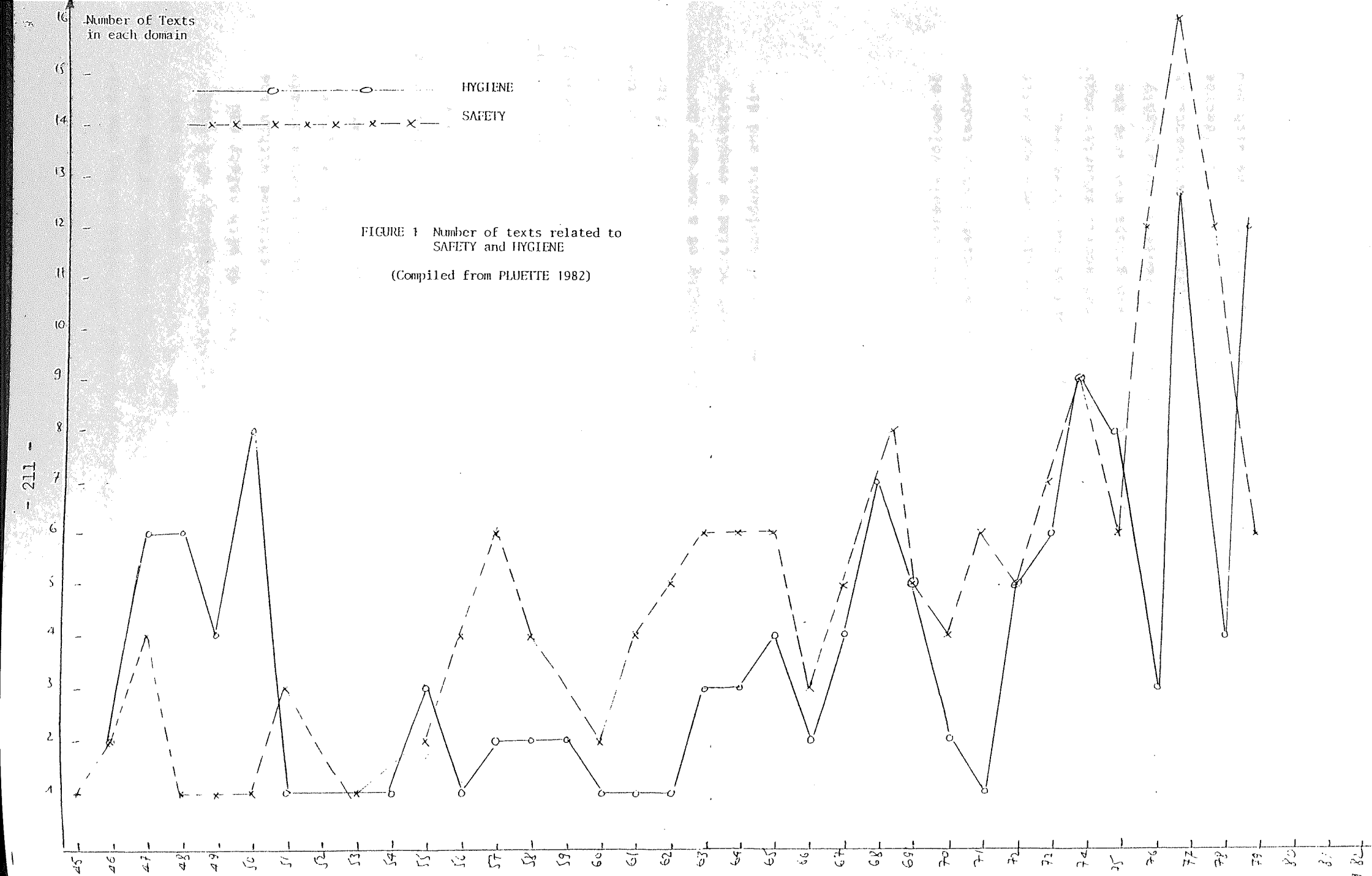

FIGURE 1 Number of texts related to SAFETY and HYGIENE

(Compiled from PLUETTE 1982)

during the first decade after the second world war while during the following decade the attention was turned to safety aspects. For the last fifteen years a more or less equal number of texts is devoted to each aspect. Overall 50% of the texts are connected with safety, 40 % with health and hygiene, and the remaining 10 % are to do with safety and health at the same time, under the same heading or contained within the same provision. The diagram also indicates that there has been a steady evolution from one decade to another. The shape of the graph suggests also continuous attention as technology develops and new dangers are discovered (see DHOQUOIS 1976).

There was a considerable jump-up" in the number of texts at the beginning of the seventies in both aspects : safety and hygiene. It was related to an acceleration in product manufacturing and particularly to that in chemical products with which the legislation tried to keep up in order to cope with all circumstances (see KEITA 1981). In addition there was a considerable rise in the accident tall (see accident statistics in chapter 2). The severity rate for exemple, had gone up from 2.07 in 1967 to 2.28 in 1974. The second increase in the number of texts which took place in the years after 1976 was even bigger. It stems from the introduction of the law of 6 th December 1976 which marked the beginning of a new era in occupational helth and safety legislation. It introducted a completely new philosophy and new concepts in the prevention of accidents and diseases at work.

CHARACTERISTICS

The brief description reveals the existence of a considerable volume of texts imposed because of the presence of danger associated with technological progress.

The texts have always been expressed in terms of prohibitions and dealt specifically with dangers as they have arisen and as they have been perceived and recognised by factory inspectors and social security engiiners and controllers. Indeed they are the two main groups who have the discretion to take these initiatives. A typical example of this highly detailled approach is the legislation on the prevention of accidents in the use of electricity. The first decree was introduced in 1935 (decree of 4th August). This decree was modified several times to cope with new

circumstances and to provide for exemptions. The latest version of it is the decree of 14th November 1964, but the there are still 58 texts related to this subject which are currently in force.
According to DUPLAT (1977), the texts of legislation, being so specific and expressed in prohibition terms, were regarded as intruding on business development and were therefore more honored in the breach rather than in the observance. He argued that much of the effort has been deployed to comply with the regulations rather than to prevent accidents and diseases. The same remarks could be made on the machinery regulations and the occupational diseases regulations.
The major drawbacks of this legislation according to SEILLAN (1981) and several other authors (see e.g. LBYLE 1977 A and PACHET 1981) is that its interpretation was such that everything that is not specifically prohibited was permitted. Chapter 2 of the thesis has indicated the breadth and depth of the problems of occupational safety and health and obviously there is no way that statutory regulations can cover all manifestations of such problems and every possible situation of danger. This situation has led the French legislator and indeed all the paties concerned with the prevention of accidents and occupational diseases to rethink in terms of a new conception, (see AYMARD 1976, CHETCUTTI 1976). Another main reason is that the legislation has always been lagging far behind the technological developments and relied heavily on the inspectors and the social security engineers to perceive the dangers associated with them.

THE LAW OF 6th. DECEMBER 1976

This law gave a general basis to the law. Every employer was imposed a duty to ensure safety, health and wefare of his employees. The law extended the duties from the users to the manufacturers and designers of machinery and equipment. This extension is considered a step forward though much criticism can still be levelled at the interpretations and assumptions that can be made of it, (see BOOTH 1976 in connection with the HSWA 1974 in Britain on this particular issue).
The law defined a very genral and all ambracing framework and as was pointed out earlier in the graph of figure 2, there were a considerable number of decrees in 1977 and in 1978 to spell out the form that law should take. There is no indication on the effect of this law in terms

of accidents and diseases prevention. A discussion on the effect of legislation in general is given in chapter 3, in connection with the role of the inspectorate.
The law gave greater discretion and power to the labour inspector and to the social security engineer and controller, these are discussed in appropriate chapters. It provided also further integration of trade unions and workers into the process by means of safety, hygiene and working conditions committees, (see LOIS AUROUX discussed in chapter 6). The important aspect of this law resides in the fact that the court now begun to think in terms of a general duty to provide a safe work place and imposes fines on employers failing to comply with this duty. The labour inspector now has a considerable discretion and can act in circumstances even if there is no specific provision for it. The drawbacks of the statutory regulations which have been too technical and very specific are now being overcome, (see SEILLAN 1983).

THE TERMINOLOGY IN THE LEGISLATION

The direct translations used in the text of the thesis are taken from the publications of the International Labour Office. Only few expressions need clarification for the purpose of their interpretation in the thesis.
The code of labour uses the expression "Hygiene et Sécurité" and the code of the social security funds uses the expression "Prévention des accidents et des maladies professionnelles". Some texts use "danger" and other use "risque". The etymology of each word is not our concern in this work, but their interpretation is essential to the analysis. Hygiene at work, also called industrial hygiene, means to practitioners and to all parties concerned with safety and health, the prevention of occupational diseases. Clarly the causes of occupational diseases are numerous, some are related to physical conditions such as noise, radiation and the length of exposure to them, others are related to organisational conditions such as working hours and rest periods for example. The word "securité" in French evokes two different, though somewhat overlaping situations. Firstly it is related to the psychological state of mind, that is a feeling of security and confidence. It is also used in the phrases to qualify the "security of employment" and the "security forces" for example. In this context the English equivalent

word would be security. The other use of the word is directly related to danger. It is the absence of danger. In this context the English word would be "safety" as used in road safety and industrial safety to mean actions to ensure driving in conditions free from dangers on the road and working conditions free from dangers in the work place. In this last context of sale working conditions both the words "safety in English" and "sécurité in French" may also be understood to include actions related to hygiene.

Safety is therefore a more general word than hygiene and may include it. This calls into question the logic of the expression "Hygiene and safety" continiously used in legislation texts and in current practice.

SEILLAN considers that traditionally each word is confined to a different domain : the prevention of accidents and the prevention of diseases and they are therfore complementary to one another. Article 232.1 of the code of labour speaks of "hygiene conditions necessary to the health of personnel at work and article 233.1 speaks of "...establishments having to be fitted out so as to garantee the safety of workpeople..." and also in "... machinery and apparatus having to be installed in the best possible safety conditions...". Surely article 233.1 should be taken to include both safety and health conditions but the fact that article 232.1 exists in the same code, one is forced to make the distinction. Caraful attention was given to these issues in the interpretation made throughout the text of the thesis.

The word "danger" has already been defined in chapter 2, but in the code it seems to be considered as interchangeable with "risk". The letter is widely used in the French legislation. As such regulations are concerned with electrical risks when they mean "electrical dangers" and the same situation occurs for dangers in condtruction, in machinery and so on.

One historical reason that is given is that the word risk was first introduced by insurance companies and that the legislators have merely retained the same word. The insurance companies and now the social security funds use the word risk to speak of accidents. Surely one can use the word risk to speak of accidents by saying "there is a risk of accidents" for example.

The problem is that the social security funds use the word risk in place of accidents and often speak of prevention of risks when they really mean prevention of accidents.

Again careful attention is given while interpreting these expressions in the text of the thesis.

APPENDIX II

LE RÔLE DU MÉDECIN DU TRAVAIL

QUESTIONNAIRE PAR S. CHAABANE

ÉTUDIANT-CHERCHEUR

Ce questionnaire fait partie d'une enquête sur l'organisation de la sécurité dans l'entreprise. Il s'agit d'une recherche purement scientifique dans le cadre de la préparation d'une thèse.

Nous vous remercions par avance de votre collaboration.

1° - Comment vous représentez-vous les visites médicales obligatoires ?

- une contrainte inutile..... ☐
- une nécessité pour le dépistale des malades professionnelles..... ☐
- une utilité pour de dépistage d'autres maladies..... ☐

Dans ce dernier cas, pourriez-vous préciser à quelles maladies vous pensez ? ____ ____ ____ ____ ____ ____ ____ ____

____ ____ ____ ____ ____ ____ ____

____ ____ ____ ____ ____ ____ ____

2° - Croyez-vous à l'efficacité de son action dans la prévention des maladies professionnelles ?

OUI ☐

NON ☐

3° - Croyez-vous à l'efficacité de son action dans la prévention ou le dépistage d'autres maladies ?

OUI ☐

NON ☐

4° - A qui d'après vous il rend service ?

- aux salariés.....☐
- aux chefs d'entreprise.....☐
- aux deux.....☐
- à personne.....☐
- aux syndicats.....☐

5° - Ces gens là prennent-ils ses conseils en considération ?

- les chefs d'entreprise.....☐
- Les salariés.....☐
- Les syndicats.....☐

6° - Etes-vous satisfait de son action ?

OUI ☐

NON ☐

7° - Où souhaiteriez-vous des améliorations ?

- la fréquence des visites médicales.....☐
- La fréquence des visites des lieux de travail.....☐
- Le pouvoir du médecin du travail dans l'entreprise.....☐
- l'indépendance vis à vis du chef d'entreprise.....☐
- autre chose.....

8° - Quelle est son utilité par rapport aux autres praticiens ?

- COMPLEMENTAIRE - ☐

- CONCURRENTE - ☐

9° - Que pensez-vous de son prestige par rapport à celui des médecins praticiens ?

- égal..... ☐
- inférieur..... ☐
- supérieur..... ☐
- pas comparable..... ☐

Pourquoi ? _____

_____

_____

10° - Pourquoi pensez-vous qu'il ait choisi cette spécialité ?
Classez de 1 à 6 en commençant par les motivations les plus fortes.

- le salaire _____ ☐
- les loisirs _____ ☐
- les heures fixes _____ ☐
- l'absence de capitaux à engager _____ ☐
- une vocation _____ ☐
- pour une autre motivation et dans ce cas laquelle ? _____

_____

_____

APPENDIX III

ENQUETE DE RECHERCHE SUR LE ROLE DU SPECIALISTE EN HYGIENE & SECURITE

Présentation de l'enquête :

Il n'existe, à présent, aucun document qui montre les différentes tâches qu'effectuent les spécialistes en Hygiène et Sécurité dans l'industrie. Les discussions sur les thèmes et le niveau de connaissance que doivent acquerir les spécialistes de l'hygiène et sécurité se "terminent" souvent par des divergences d'opinion.

Avant d'aborder la conception des programmes d'enseignement, il est jugé nécessaire de combler cette lacune.

La difficulté majeure dans l'inventaire de toutes les tâches techniques et de gestion réside dans la variance et la complexité de ces tâches. Interroger des praticiens sur ce qu'ils font révèle très peu d'informations ; il s'agit souvent d'un pourcentage minime de ce qu'ils font effectivement.

Les gens oublient les petites, mais souvent importantes, choses telles que la conversation par téléphone sur un problème donné, des petits conseils à droite et à gauche, les discussions avec les contremaîtres durant les inspections de routine etc... Le meilleur moyen d'obtenir une liste complète des tâches serait de demander aux personnes de garder un agenda sur lequel ils marqueraient toutes les tâches au fur et à mesure qu'ils les accomplissent Encore faut-il qu'il y ait des gens qui veulent bien le faire.

Nous reconnaissons que les spécialistes en Hygiène et Sécurité sont quotidiennement très chargés ; pour cela nous avons développé une stratégie pour essayer d'obtenir le maximum d'informations pour un minimum d'efforts.

Nous aimerions rassembler les informations en deux étapes :

- La première consiste à demander à un certain nombre de volontaires de garder un agenda pendant une à deux semaines. A partir de ces agendas, nous établissons une liste aussi complète que possible des tâches accomplies par le spécialiste en Hygiène et Sécurité. La liste sera ensuite présentée à un nombre important de praticiens pour vérifier celles des tâches qui sont les leurs et ajouter si nécessaire celles qui sont omises.

En conséquence nous vous prions de bien vouloir apporter votre collaboration : Ci-joint vous trouverez un agenda que nous vous demandons de remplir au fur et à mesure que vous faîtes votre travail quotidien. Nous vous prions de le tenir pour une semaine à deux, néanmoins nous acceptons des agendas de moins d'une semaine. Toutes les informations sont utiles.

Nous vous suggerons de commencer une nouvelle page chaque matin et à chaque fois que vous commencez une activité vous l'inscrivez dessus. Lorsque vous aurez terminé l'activité en question vous notez le temps que celle-ci vous a pris environ. Vous essayez de la remplir au fur et à mesure que vous entreprenez vos activités pour vous éviter d'en oublier.

Nous avons prévu trois parties dans l'agenda : la première partie concerne les activités, la deuxième concerne les questions d'hygiène et sécurité sur lesquelles vous êtes interrogées, la troisième concerne les informations que vous aviez à chercher. Ainsi nous espérons avoir convert l'ensemble de toutes les tâches. Si vous hésitez sur quelque chose inscrivez là quand même dans l'une des trois parties prévues.

Dans chaque partie nous avons besoin d'assez d'informations pour pouvoir déterminer le thème exact de l'activité en question (le risque que vous avez analysé, le procédé sur lequel vous vous êtes penché etc...), et à quel degré d'analyse vous l'avez considéré (exemples : si vous faisiez l'enquête sur un accident, s'agit-il d'une simple discussion avec le contremaître et la victime ou alors une enquête avec des mesures, prises d'échantillons pour analyse etc... Si vous étiez dans une réunion pour commander du nouveau matériel, quels sont les aspects sur lesquels vous avez été interrogés pour donner votre avis ?

S'il est plus facile pour vous de nous envoyer une copie du P.V. de réunion (anonyme et confidentiel) nous vous en serons reconnaissants. Notre objectif est d'avoir le maximum d'informations pour le minimum de dérangement.

EXEMPLE : A la fin d'une journée de travail l'agenda peut se présenter comme suit :

Activité/Tâche/Réunion	Durée approximative
1 - Lecture de la circulaire sur les nouveaux équipements de levage, les cours de formation lettre d'un avocat sur un problème de surdité .	1/4 H
2 - Faire le plan de travail pour la journée	1/4 H
3 - Une inspection mensuelle de routine dans le magasin Risques remarqués : les grues, l'accès des camions	2 H
4 - Commencer les préparations du rapport	1/2 H
5 - Révision du comité des délégués Hygiène et Sécurité	1 1/2 H

Questions sur lesquelles vous êtes interrogé	Par qui ?
Quel est notre stock de lunettes de sécurité ; pouvons-nous le réduire ?	Finance
Est-ce que la loi exige la formation des conducteurs de chariot ?	Délégué de sécurité
Sur quelle hauteur nous pouvons stocker les cartons que nous utilisons dans le magasin	Responsable du magasin
etc...	

Informations que vous avez à chercher	où vous avez trouvé l'information
_ Si la hauteur des cartons gênait les sprinklers	catalogue sur les sprinklers téléphoner à un fournisseur
_ Les meilleurs types de formation pour les conducteurs de chariot auto-moteur.	téléphoner à un collègue.
etc...	

N.B. Une fois terminé, nous vous prions d'adresser le questionnaire et l'agenda à Monsieur S. CHAABANE, Etudiant-chercheur au Département HYGIENE & SECURITE de l'I.U.T. "A" de Bordeaux I - Domaine Universitaire - 33405 TALENCE CEDEX -

AGENDA LE 1983

1 - ACTIVITE/TÂCHE/REUNION DUREE APPROXIMATIV

2 - PROBLEMES SUR LESQUELS VOUS ETIEZ INTERROGES PAR QUI ?

3 - INFORMATIONS QUE VOUS AVIEZ À RECHERCHER SOURCE D'INFORMATION

APPENDIX IV

ENQUETE ANONYME

SUR LES ACTIVITÉS DU SPÉCIALISTE EN HYGIENE ET SÉCURITÉ DANS L'ENTREPRISE

Renseignements concernant l'entreprise dans laquelle vous exercez :
(cocher la case qui correspond à votre cas)

1 - A quel type d'activité professionnelle appartient votre entreprise ?

. Bâtiments & Travaux Publics . ☐
. Métallurgie ..... ☐
. Chimie ..... ☐
. Autres : précisez ..... ☐

2 - Dans quelle tranche d'effectif de salari se situe-t-elle ?

. Moins de 100 salariés ..... ☐
. entre 100 et 500 salariés..... ☐
. entre 500 et 1500 salariés..... ☐
. plus de 1500 salariés ..... ☐

3 - Quelle est l'organisation de la sécurité dans votre établissement ?

. Un seul service ..... ☐
. Plusieurs services de sécurité :
  * service de prévention incendie ..... ☐
  * service de condition de travail ..... ☐
  * service de sécurité des installations ..... ☐
  * autres (spécifier) ..... ☐

4 - Quel est votre titre dans le service de sécurité ?

. Ingénieur ..... ☐
. Technicien ..... ☐
. Animateur ..... ☐
. Autres (spécifier) ..... ☐

5 - Quel est le rôle que vous assumez ?

. Un rôle plutôt fonctionnel ..... ☐
. Un rôle plutôt opérationnel ..... ☐

RECOMMANDATIONS POUR REPONDRE AU QUESTIONNAIRE

Nous avons énuméré un certain nombre de tâches concernant la prévention des accidents et des maladies professionnelles dans l'entreprise.
Compte-tenu de votre expérience professionnelle, donner une note de zéro à trois (0 à 3) à chacune des tâches selon que vous estimez :

- que cette tâche n'a *jamais* fait partie de vos occupations : note 0
- qu'elle fait *rarement* partie de vos occupations : note 1
- qu'elle fait *plutôt* partie de vos occupations : note 2
- qu'elle fait *toujours* partie de vos préoccupations : note 3

Chaque tâche doit être notée indépendamment des autres. Il est indispensable que toutes les activités soient notées. Vous pouvez compléter votre note par une remarque qui précise votre interprétation de la question.

Note: The items presented in the questionnaire are the same as the ones on the following questionnaire.

APPENDIX V

RECOMMANDATIONS POUR REPONDRE AU QUESTIONNAIRE

Nous avons énuméré un certain nombre de tâches concernant la prévention des accidents et des maladies professionnelles dans l'entreprise.
Compte-tenu de votre expérience professionnelle, donner une note de zéro à trois (0 à 3) à chacune des tâches selon que vous estimez que, pour un technicien ou un ingénieur en Hygiène et Sécurité :

- cette tâche ne doit *jamais* faire partie de ses occupations : note 0
- elle doit *rarement* faire partie de ses occupations : note 1
- elle doit faire *plutôt* partie de ses occupations : note 2
- elle doit *toujours* faire partie de ses occupations : note 3

Chaque tâche doit être notée indépendamment des autres. Il est indispensable que toutes les activités soient notées. Vous pouvez compléter votre note par une remarque qui précise votre interprétation de la question.

A1 - S'occuper de la prévention des accidents	0	1	2	3
A2 - S'occuper de la prévention des maladies professionnelles	0	1	2	3
A3 - Minimiser les pertes matérielles dues aux accidents	0	1	2	3
A4 - S'occuper de la prévention des incendies	0	1	2	3
B1 - Apporter une contribution pendant la conception des installations et des équipements	0	1	2	3
B2 - Apporter une contribution à l'élaboration de la politique de sécurité	0	1	2	3
B3 - Veiller à l'entretien des installations, des équipements et des dispositifs de sécurité	0	1	2	3
B4 - Elaborer des consignes de sécurité	0	1	2	3
C1 - Inspecter les lieux de travail	0	1	2	3
C2 - Effectuer des enquêtes d'accidents	0	1	2	3
C3 - Inspecter régulièrement les dispositifs de sécurité	0	1	2	3
C4 - Etablir les statistiques des accidents et des maladies professionnelles	0	1	2	3

C5 - Réaliser des analyses de fiabilité des systèmes (méthode du type arbre des causes, mode et effet etc.....) 0 1 2 3

C6 - Effectuer des prélèvements dans l'atmosphère du milieu de travail 0 1 2 3

C7 - Effectuer des contrôles physiques (contrôle non destructif par ultrason par exemple)..... 0 1 2 3

C8 - Faire passer des audiogrammes aux ouvriers exposés au bruit 0 1 2 3

C9 - Vérifier l'aptitude de l'ouvrier à son poste de travail 0 1 2 3

C10 - Participer au planning des interventions de maintenance 0 1 2 3

D1 - Déterminer les facteurs d'accidents 0 1 2 3

D2 - Evaluer le potentiel destructeur du danger 0 1 2 3

D3 - Evaluer les probabilités du risque 0 1 2 3

D4 - Faire des analyse de poste de travail 0 1 2 3

D5 - Ordonner des analyses d'expertise lorsque c'est nécessaire 0 1 2 3

D6 - Interpréter le contenu de la règlementation en Hygiène et Sécurité du travail 0 1 2 3

E1 - Etablir des analyses de coût des accidents 0 1 2 3

E2 - Etablir des études de coût/utilité pour des stratégies de prévention 0 1 2 3

E3 - Proposer des solutions techniques 0 1 2 3

E4 - Chercher des solutions techniques en faisant appel à des organismes compétents 0 1 2 3

E5 - Veuiller à la formation des salariés en matière de prévention des accidents du travail 0 1 2 3

E6 - Choisir les équipements de protection individuelle 0 1 2 3

E7 - Rédiger des consignes de sécurité 0 1 2 3

E8 - Proposer des changements dans les programmes de production pour une meilleure adaptation de l'ouvrier au travail 0 1 2 3

E9 - Fournir des autorisations d'intervention de réparation et de maintenance sur des équipements reconnus dangereux 0 1 2 3

E10- Arrêter le déroulement d'une opération ou la marche d'une machine présentant un danger grave et imminent.. 0 1 2 3

E11- Sensibiliser les salariés aux problèmes d'Hygiène et Sécurité par des affiches, des films, des conférences 0 1 2 3

E12- Convaincre la hiérarchie du bien fondé des stratégies de prévention 0 1 2 3

E13- Expliquer à la hiérarchie ses obligations en matière de prévention 0 1 2 3

F1 - Demander de crédits propres pour la prévention 0 1 2 3

F2 - Demander des subventions à la Caisse d'Assurances Maladies pour lancer un programme de sécurité 0 1 2 3

F3 - Négocier la mise en oeuvre des stratégies de prévention 0 1 2 3

F4 - Participer aux réunions des CHSCT 0 1 2 3

F5 - Assurer la mise à jour des registres de sécurité 0 1 2 3

F6 - Veiller au respect de la règlementation Hygiène et Sécurité 0 1 2 3

F7 - Ordonner l'installation des équipements et dispositif de sécurité 0 1 2 3

F8 - Distribuer les équipements de protection individuelle . 0 1 2 3

F9 - Assurer l'entretien des équipements de protection individuelle 0 1 2 3

F10- Assurer des campagnes de sécurité 0 1 2 3

G1 - Assurer la mise en oeuvre des mesures préconisées par les ingénieurs et les contrôleurs des Caisses d'Assurances et/ou l'Inspection du Travail 0 1 2 3

G2 - S'assurer du maintien des concentrations atmosphériques dans les limites prévues par les normes 0 1 2 3

G3 - S'assurer de l'exécution des programmes de formation en prévention prévus pour les salariés 0 1 2 3

G4 - S'assurer du respect des consignes de sécurité par les salariés et les cadres 0 1 2 3

H1 - Dans quel type d'activités considérez-vous la nécessité de l'emploi d'un spécialiste d'Hygène et Sécurité à plein temps ? B & TP, Métallurgie, Chimie, autres. Précisez. . . . . .

H2 - A partir de quelle tranche d'effectif .....

H3 - Quel rôle doit-il assumer ?
- plutôt fonctionnel _ _ _ _ ☐
- plutôt opérationnel _ _ _ ☐

UNIVERSITE de BORDEAUX I
INSTITUT UNIVERSITAIRE de TECHNOLOGIE A

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APPENDIX VI

Madame, Mademoiselle, Monsieur,

L'enquête ci-après fait partie d'une recherche entreprise par M. CHAABANE chercheur au LARSACT de l'I.U.T. "A" de BORDEAUX I.

Nous cherchons à cerner les différents types d'activités de "l'Ingénieur", du "Technicien", de "l'animateur de sécurité" dans l'entreprise.

Les résultats de cette enquête nous permettront de contribuer à l'élaboration de modèles de programmes pédagogiques en fonction du niveau de l'auditoire, du temps de formation et bien entendu des préoccupations et des demandes du monde du travail.

En vous remerciant d'avance pour votre collaboration, veuillez agréer, Madame, Mademoiselle, Monsieur, l'expression de nos sentiments distingués.

S. CHAABANE,
Chercheur.

APPENDIX VII

L'enquête que nous avons menée se caractérise, comme la plupart des enquêtes, par un grand nombre de résultats à exploiter. Dans notre cas les individus observés (218 au total) sont caractérisés par un nombre important de variables (ici les 51 questions) qui possèdent elles-mêmes 4 modalités.

La statistique classique, axée sur l'étude d'un seul caractère (ou variable) mesuré sur un petit ensemble d'individus, n'est donc pas adaptée à notre problème. Nous aurons donc recours à des méthodes d'analyse des données (ou analyse statistique multidimensionnelle) qui permettent une étude globale de ces variables, mettant en évidence des liaisons, des ressemblances ou des différences et des tendances. Ces méthodes d'analyse se distinguent de la statistique classique par le fait qu'elles ne sont pas fondées sur des hypothèses très restrictives ; elles transforment les données pour les visualiser dans un plan et/ou les classer en groupes homogènes tout en ne perdant qu'un minimum d'information. Notons que l'exécution des calculs complexes inhérents à ces méthodes ne pose plus de problème grâce à l'informatique.

Dans le cadre de notre étude nous avons mis successivement en oeuvre trois de ces méthodes factorielles :

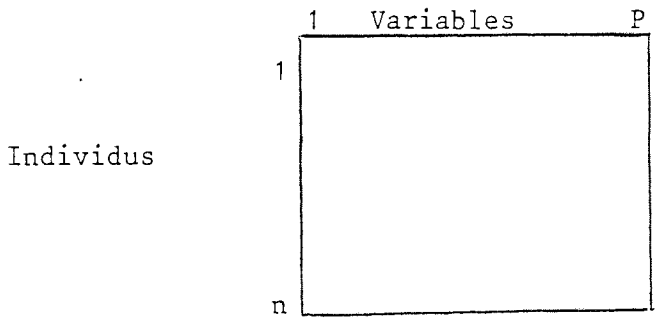
- l'analyse en composantes principales (A.C.P),
- l'analyse factorielle discriminante (A.F.D),
- l'analyse factorielle des correspondances (A.F.C.)

METHODES D'ANALYSE FACTORIELLES

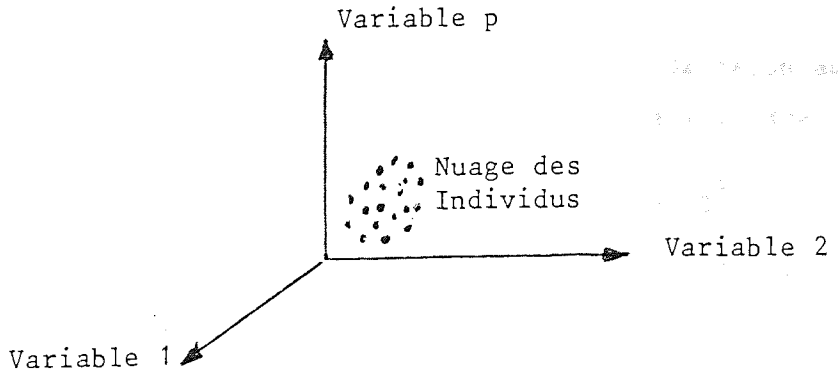
Cette annexe a pour but de présenter très succinctement les méthodes d'analyse de données multi-dimensionnelles que nous avons utilisées au lecteur non familiarisé avec ces techniques. Une présentation mathématique formelle approfondie n'est pas nécessaire pour suivre l'interprétation des résultats qui seront exposés par la suite. Cependant, un certain nombre de notions de base sont indispensables pour bien saisir la représentation de l'information utilisée. Nous renvoyons le lecteur désireux d'approfondir ses connaissances dans le domaine étudié aux références (1, 2, 3, 4).

1 - GENERALITES -

Les données de départ sont présentées sous la forme d'un tableau de n Individus caractérisés par des valeurs sur P Variables, dont on veut extraire l'information.



Ce tableau peut être représenté par le nuage des individus dans l'espace des variables.



Le grand nombre de variables (c'est-à-dire la grande dimension de l'espace de variables) ne permettant pas une représentation simple et accessible à l'oeil, le problème est de trouver un espace de dimension plus faible permettant de "visualiser" les sous populations éventuelles (cet espace est aussi appelé espace d'arrivée).

Remarque : On montre que variables et individus jouent un rôle symétrique, et que l'on peut également considérer le nuage des variables dans l'espace des individus. Nous nous limiterons dans cet exposé au premier espace présenté. La transformation des résultats obtenus sur le nuage des individus au nuage des variables sera simplement citée lorsque ce sera nécessaire. On verra cependant que, selon la méthode d'analyse employée, il n'y a pas toujours une symétrie complète pour la représentation des individus et des variables dans l'espace trouvé.

2 - PRESENTATION FORMELLE DES ANALYSES FACTORIELLES -

Le problème peut se formuler de la façon suivante :
Etant donné un tableau X(n,p), peut-on reconstituer les (np) éléments xij qui le composent à partir d'un plus petit nombre de valeurs ?
Supposons qu'il existe un vecteur $\underline{u}_1$ à n composantes, un vecteur $\underline{v}_1$ à p composantes et un scalaire α_1 tels que l'on puisse écrire :

$$X\ (n,p) = \alpha_1 \underline{u}_1\ (n) \wedge \underline{v}_1\ (p) = \alpha_1 \underline{u}_1\ (n) \cdot \underline{v}_1^{\,t}\ (p)$$

(l'opération "$\wedge$" étant le produit vectoriel, et $\underline{v}_1^{\,t}$ étant le vecteur ligne $\underline{v}_1$ transposé).

On peut alors dire que l'on a reconstitué X à l'aide de (n + p) valeurs (mathématiquement, cela signifie que X est de rang 1), et que nous avons atteint le but recherché.

En pratique, il est rare que le problème se résolve de façon aussi simple. On cherche donc une approximation $\tilde{X}$ de X, de rang q, avec :

$$\tilde{X} = \alpha_1 \cdot \underline{u}_1 \cdot \underline{v}_1^{\,t} + \alpha_2 \cdot \underline{u}_2 \cdot \underline{v}_2^{\,t} + \ldots + \alpha q \cdot \underline{uq} \cdot \underline{vq}^{\,t}$$

et $$X = \alpha_1 \cdot \underline{u}_1 \cdot \underline{v}_1^{\,t} + \alpha_2 \cdot \underline{u}_2 \cdot \underline{v}_2^{\,t} + \ldots + \alpha q \cdot \underline{uq} \cdot \underline{vq}^{\,t} + E$$

E est appelée matrice résiduelle.

Les (np) valeurs ont été reconstituées avec q(n+p) valeurs, la matrice ne contenant pratiquement plus d'information significative.

La détermination des vecteurs $\underline{u}i$ et $\underline{v}i$ est guidée par les caractéristiques que l'on veut mettre en évidence dans l'espace d'arrivée. Pour distinguer au mieux les sous populations éventuelles du nuage, les vecteurs $\underline{V}i$ à déterminer sont les vecteurs directeurs des droites passant par l'origine qui ajustent au mieux le nuage, c'est-à-dire qui maximisent la somme des carrés des projections des points du nuage sur ces droites. On montre alors que les vecteurs $\underline{V}i$ cherchés sont les vecteurs propres de la matrice : $X^t.X$ (X^t = X transposée) associés aux valeurs propres λi telles que :

$$\lambda i > \lambda i + 1 \qquad \text{pour } i = 1, 2, \ldots; p-2, p-1$$

La fidélité de l'approximation trouvée est représentée par ce que l'on appelle le pourcentage de variance , qui s'exprime sous la forme :

$$Tq = \frac{\lambda_1 + \lambda_2 + \ldots + \lambda q}{\lambda_1 + \lambda_2 + \ldots + \lambda p}$$

q est calculé de façon à obtenir une approximation satisfaisante.
Par dualité, on montre que les vecteurs $\underline{u}_i$ sont les vecteurs propres de la matrice : $X.X^t$, associés aux valeurs propres μi telles que :

$$\mu i < \mu i + 1 \text{ pour } i = 1,2,\ldots,p-1$$

et que l'on a :

$$\mu i = \lambda i \text{ pour } i = 1,2,\ldots,p$$

$$\mu i = 0 \text{ pour } i = p + 1,\ldots,n$$

$$ui = \frac{1}{\sqrt{\lambda i}} \cdot X. \underline{v}i \text{ pour } i = 1,\ldots;p$$

La reconstitution des données de départ est obtenue en calculant :

$$X = \sum_{i=1}^{p} \lambda i.\underline{u}i.\underline{v}_i^t$$

Si les (p-q) plus petites valeurs propres sont négligeables, on peut limiter la sommation aux q premiers termes :

$$\tilde{X} = \sum_{i=1}^{q} \lambda i.\underline{u}i.\underline{v}_i^t \simeq X$$

Si q est notablement plus petit que p, nous avons atteint le but fixé en projetant le nuage dans l'espace engendré par les premiers vecteurs propres.
Les méthodes d'analyses factorielles utilisent généralement ce principe ; elles ne diffèrent entre elles que par la notion de distance définie sur les données sur lesquelles elles opèrent, et donc par l'espace de projection obtenu. Nous en examinerons trois : l'analyse en composantes principales ; l'analyse factorielle des correspondances ; l'analyse factorielle des correspondances multiples.

3 - ANALYSE EN COMPOSANTES PRINCIPALES -

Elle utilise un tableau de mesures de p variables V prises pour n individus que l'on notera I x V. Ces mesures peuvent être hétérogènes. Plusieurs analyses sont possibles, et pour éviter des problèmes d'échelle ou d'origine arbitraires, les données sont centrées et réduites (analyse en composantes principales normée). Ce qui signifie que l'on a fait coïncider l'origine des axes avec le centre de gravité du nuage, et que la dispersion du nuage est normalisée (écart type = 1).
Dans ce cas, on constate que la matrice, dont on cherche les vecteurs et valeurs propres, est la matrice de corrélation. Elle est aussi l'expression de la matrice d'inertie du nuage.
On sera donc amené à observer les projections des individus et des variables dans les plans principaux d'inertie de chacun des deux nuages. Dans la pratique, on projette sur le même plan individus et variables, en faisant coïncider origines et axes. Il faut garder à l'esprit que cette coïncidence n'est dûe qu'à un artifice, et que l'on ne peut seulement comparer :
- la proximité de deux individus entre eux
- la proximité de deux variables entre elles
- la position d'un individu par rapport à l'ensemble des variables
- la position d'une variable par rapport à l'ensemble des individus.

Néanmoins, du fait de sa généralité et de la faiblesse des hypothèses qu'elle nécessite, cette méthode reste d'un grand intérêt.

4 - ANALYSE FACTORIELLE DES CORRESPONDANCES -

Cette méthode utilise comme tableau de départ un tableau de contingence.

Il est composé de nombres réels positifs ou nuls. Le terme xij du tableau X représente la fréquence d'obtention de la valeur correspondant à l'indice j pour le sujet correspondant à l'indice i. On parlera d'analyse du "profil" des lignes par rapport aux colonnes, et de celle du "profil" des colonnes par rapport aux lignes.

On remarque une différence fondamentale avec l'analyse en composantes principales : les transformations faites sur les données brutes dans les deux espaces sont ici identiques. Cette symétrie nous permet de projeter et d'interpréter les profils lignes et les profils colonnes dans le même espace sans aucun artifice. Il est ainsi possible de comparer la proximité d'un élément ligne et d'un élément colonne.

Par contre, les transformations effectuées sur le tableau de départ ne nous permettent pas de "retrouver" les individus ni de les projeter sur les espaces de profils.

On est amené à définir et utiliser des quantités permettant une aide à l'interprétation des axes :
- Les contributions absolues qui exhibent la part prise par une variable dans l'inertie expliquée par un facteur : cette part va être calculée par rapport à l'ensemble des variables.
- les contributions relatives qui exhibent la part de la dispersion d'une variable expliquée par un facteur.
Le terme facteur correspondant au terme αi défini au paragraphe 2.
- La contribution absolue d'une variable est donc d'autant plus importante qu'elle participe à "l'allongement" du nuage le long de l'axe étudié ; la contribution relative est d'autant plus élevée que l'angle que fait cet axe et la droite joignant l'origine à cette variable est plus faible.

4 - INTERPRETATION -

L'analyse des réponses au questionnaire (tableau n° 1) nous conduit à diagonaliser la matrice des corrélations, dont le bloc sous-diagonal est donné par le tableau.
Le premier résultat numérique interprétable est consituté par la liste des valeurs propres (51 au total) et des pourcentages de variance (ou d'inertie) figurant au tableau n°2 . Les premiers pourcentages ne sont

MATRICE DES CORRELATIONS

(TOUS LES COEFFICIENTS SONT MULTIPLIES PAR 1000)

Tableau 1. Matrice des Correlations

	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	D1	D2	D3	D4	D5	D6	E1
A1	1000																								
A2	251	1000																							
A3	92	-124	1000																						
A4	292	160	-37	1000																					
B1	176	182	-103	421	1000																				
B2	317	131	16	424	467	1000																			
B3	169	12	9	347	302	363	1000																		
B4	139	-54	276	249	156	290	413	1000																	
C1	336	74	-67	233	326	486	299	159	1000																
C2	328	45	-75	257	228	415	237	161	535	1000															
C3	191	36	-30	394	335	264	424	314	376	378	1000														
C4	206	62	-17	155	117	206	203	261	229	390	149	1000													
C5	155	152	-117	287	346	278	123	134	193	174	231	204	1000												
C6	111	124	-83	157	260	225	191	54	203	187	253	311	445	1000											
C7	103	73	-152	217	370	121	135	32	205	62	211	32	347	549	1000										
C8	49	11	-14	-22	17	58	105	7	32	148	93	200	76	308	138	1000									
C9	74	34	73	-53	-150	-87	11	117	-123	34	82	193	-64	45	-45	487	1000								
C10	95	-5	-42	291	248	102	164	264	68	108	244	54	290	205	362	26	141	1000							
D1	337	135	-22	314	360	413	235	210	464	464	190	313	314	263	192	57	-24	265	1000						
D2	235	-15	139	109	143	97	143	268	62	45	129	14	231	153	145	-7	96	373	369	1000					
D3	302	155	15	214	297	304	110	105	415	381	176	280	297	315	255	61	13	163	630	481	1000				
D4	239	283	4	144	297	234	107	68	341	247	197	295	361	373	334	251	79	188	499	225	519	1000			
D5	164	275	-146	79	137	136	-15	-69	147	289	92	219	124	162	125	109	111	26	314	36	282	294	1000		
D6	152	32	173	128	-12	242	112	107	86	86	91	239	-46	84	-90	189	141	-10	76	37	118	94	133	1000	
E1	141	62	103	25	121	110	162	208	11	57	61	305	252	253	88	109	57	147	212	229	149	250	157	175	1000
E2	162	13	-78	219	291	226	194	106	236	254	164	335	340	378	336	161	-30	178	344	175	359	441	186	44	565
E3	246	-17	-113	229	442	318	274	164	442	248	273	134	240	225	281	27	-82	180	366	228	363	267	70	6	83
E4	259	161	-145	317	551	374	295	159	403	296	325	159	304	330	280	26	-107	204	406	173	361	354	256	49	151
E5	250	23	65	148	117	291	241	404	308	227	133	134	283	88	-21	74	49	193	376	270	269	221	56	116	237
E6	209	-21	100	163	173	320	279	406	288	314	278	394	179	201	-5	140	80	129	288	117	208	228	27	189	167
E7	168	71	127	240	150	274	329	551	235	295	377	326	191	127	42	38	124	260	264	152	191	151	23	310	132
E8	188	161	-104	109	204	191	110	48	137	182	192	176	396	241	205	197	87	264	333	210	316	425	221	-10	149
E9	163	22	-49	223	327	266	315	172	189	215	349	90	280	250	262	40	-42	369	362	217	296	253	172	54	179
E10	140	-59	-52	177	136	268	261	476	238	211	305	52	215	84	84	-10	87	247	125	231	82	-47	42	72	131
E11	200	45	-65	125	190	361	247	232	417	330	199	334	242	264	163	-48	-153	140	351	141	299	181	74	83	35
E12	233	55	-104	318	364	476	267	98	506	303	185	235	281	237	152	17	-211	67	546	150	370	350	109	131	103
E13	272	149	-5	150	256	314	192	267	288	197	97	243	168	17	-62	10	1	63	294	54	196	154	97	149	151
F1	37	55	42	[illegible]	248	191	134	258	63	46	103	12	210	164	119	-64	-88	211	228	259	226	126	144	3	187
F2	63	32	22	43	224	271	213	221	122	98	207	1	189	213	261	-58	11	231	200	328	172	153	135	-31	197
F3	16	19	-99	64	138	162	-3	120	56	-16	-27	101	295	140	120	-8	8	159	201	222	237	194	169	26	97
F4	271	45	-11	273	345	493	372	336	495	435	243	309	304	295	158	80	-81	118	474	116	369	325	110	1	176
F5	173	13	-15	316	220	249	341	361	155	286	395	241	214	226	164	45	55	331	219	208	148	107	62	78	203
F6	-2	-9	139	55	-12	36	141	307	109	88	134	242	75	-10	-94	-173	63	105	76	147	115	41	-49	164	79
F7	-26	4	-24	32	53	64	270	127	180	135	181	177	106	-30	-5	-54	-69	0	70	-6	95	39	196	133	-24
F8	123	-20	-11	117	144	71	207	278	128	142	240	231	198	166	217	-27	65	287	65	116	57	39	16	39	223
F9	141	[illegible]	-47	241	155	30	325	255	112	109	325	131	111	157	257	-27	79	338	105	148	39	75	28	71	231
F10	216	[illegible]	-113	319	375	476	285	178	417	415	273	347	340	287	191	18	-184	219	398	131	331	239	159	161	205
G1	[illegible]	4	10	229	256	299	275	269	238	265	287	252	181	70	29	-38	-38	186	259	90	211	80	74	106	78
G2	175	217	-40	[illegible]	207	125	251	101	202	139	231	230	245	490	360	49	-30	196	185	230	310	314	193	84	229
G3	[illegible]	153	[illegible]	[illegible]	[illegible]	146	212	222	157	101	109	215	207	136	42	5	-5	185	276	290	207	198	91	164	206
G4	172	[illegible]	4	[illegible]	175	[illegible]	306	269	334	300	302	228	62	231	115	46	-17	116	231	112	195	208	28	229	15

	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	G1	G2	G3
E2	1000																								
E3	225	1000																							
E4	342	547	1000																						
E5	154	259	377	1000																					
E6	168	204	292	461	1000																				
E7	125	119	217	323	450	1000																			
E8	349	159	254	247	224	141	1000																		
E9	340	259	304	250	235	238	364	1000																	
E10	49	271	170	327	302	334	103	317	1000																
E11	179	313	345	296	334	339	156	120	127	1000															
E12	261	493	487	365	235	138	187	136	131	544	1000														
E13	123	364	236	310	195	257	165	13	187	351	506	1000													
F1	161	171	202	277	247	161	243	260	315	240	157	157	1000												
F2	201	277	273	217	158	112	223	261	329	126	212	234	533	1000											
F3	112	156	161	190	111	61	318	244	100	162	186	217	355	347	1000										
F4	269	313	373	356	451	272	217	206	179	409	447	248	119	229	130	1000									
F5	191	210	185	233	231	369	163	303	302	214	157	175	266	244	92	278	1000								
F6	-11	112	57	156	231	371	-44	23	268	259	140	297	194	76	121	54	296	1000							
F7	-5	100	0	89	105	228	5	194	195	131	104	105	151	61	221	97	213	205	1000						
F8	206	133	135	172	314	292	133	245	230	180	17	21	309	246	28	161	412	166	196	1000					
F9	235	155	140	172	214	197	217	369	198	110	46	25	279	234	29	85	374	77	236	634	1000				
F10	377	344	414	337	295	278	244	239	92	570	521	390	231	183	223	360	278	118	115	176	175	1000			
G1	111	313	264	234	265	315	151	262	252	324	228	257	266	231	127	215	259	260	230	236	189	309	1000		
G2	255	246	256	93	66	80	234	205	157	123	129	69	159	284	92	218	258	27	81	152	234	113	253	1000	
G3	170	202	251	404	232	209	292	200	170	138	233	222	236	150	139	246	164	270	31	186	155	230	205	269	1000
G4	247	315	266	197	262	333	71	176	181	363	377	246	102	146	121	200	256	268	177	163	191	370	334	250	194

	G4
G4	1000

Tableau 1 (suite)

LES VALEURS PROPRES VAL(1)= 11.19098

NUM	ITER	VAL PROPRE	POURCENT	CUMUL	HISTOGRAMME DES VALEURS PROPRES DE LA MATRICE
1	0	11.19098	21.942	21.942	!*!**********!**********!**********!**********
2	0	3.35644	6.585	28.527	!*!******!**
3	1	2.89637	5.679	34.006	!*!******!*
4	1	2.22992	4.569	38.575	!*!********
5	1	2.13644	4.189	42.763	!*!********
6	0	1.65262	3.240	46.004	!*!******
7	1	1.49713	2.935	48.939	!*!*******
8	1	1.41221	2.769	51.708	!*!*******
9	2	1.35138	2.650	54.358	!*!*******
10	1	1.29447	2.538	56.896	!*!*******
11	1	1.21990	2.392	59.288	!*!*******
12	2	1.16414	2.283	61.570	!*!******
13	1	1.11725	2.191	63.761	!*!******
14	1	1.04540	2.050	65.811	!*!******
15	1	0.98066	1.923	67.733	!*!*****
16	1	0.90676	1.778	69.511	!*!*****
17	2	0.88319	1.732	71.243	!*!*****
18	2	0.84000	1.647	72.890	!*!*****
19	1	0.80048	1.570	74.459	!*!****
20	1	0.76813	1.506	75.965	!*!****
21	1	0.71853	1.409	77.374	!*!****
22	1	0.71041	1.393	78.767	!*!****
23	1	0.65804	1.290	80.057	!*!****
24	1	0.62465	1.225	81.282	!*!***
25	2	0.60586	1.188	82.470	!*!***
26	2	0.59805	1.173	83.643	!*!***
27	3	0.58123	1.140	84.782	!*!***
28	2	0.54561	1.070	85.852	!*!***
29	2	0.52154	1.023	86.875	!*!***
30	1	0.48164	0.944	87.819	!*!***
31	3	0.46071	0.903	88.722	!*!**
32	2	0.45160	0.885	89.608	!*!**
33	3	0.45168	0.846	90.454	!*!**
34	2	0.40357	0.791	91.245	!*!**
35	2	0.38987	0.762	92.008	!*!**
36	6	0.38503	0.755	92.763	!*!**
37	2	0.36258	0.711	93.474	!*!**
38	2	0.33918	0.665	94.139	!*!**
39	3	0.31699	0.622	94.760	!*!**
40	2	0.30826	0.604	95.365	!*!**
41	2	0.28955	0.566	95.931	!*!**
42	2	0.27767	0.437	96.467	!*!*
43	2	0.25255	0.495	96.962	!*!*
44	1	0.24754	0.485	97.448	!*!*
45	3	0.22535	0.442	97.889	!*!*
46	2	0.20865	0.409	98.298	!*!*
47	2	0.19542	0.383	98.681	!*!*
48	3	0.19065	0.374	99.042	!*!*
49	2	0.17102	0.335	99.377	!*!*
50	1	0.16778	0.329	99.706	!*!*
51	4	0.15034	0.294	100.000	!*!*

Tableau 2 : Variance percentages and natural values.

QLT = qualité de la représentation = $\sum$ cos² / axes principaux = $\sum$ COR

CTR = contribution (en millièmes) du point considéré au facteur (à l'axe)

INR ? = contribution (en millièmes) du point considéré à l'inertie totale

I1	QLT	POID	INR	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
1!001	608	1	13	-8164	477	27	-1194	10	2	-3389	82	18	-430	1	0	2296	38	11
2!002	509	1	3	1081	42	0	-218	2	0	1520	83	4	3256	379	21	319	4	0
3!003	523	1	2	2765	204	2	-1234	56	2	-1163	49	2	1947	139	7	-1433	75	4
4!004	275	1	4	-2408	145	2	-1273	41	2	-1754	77	5	687	12	1	156	1	0
5!005	486	1	6	-3340	167	5	1241	23	2	-1088	18	2	3704	205	27	-2210	73	10
6!006	383	1	4	-470	5	0	46	0	0	-2547	154	10	2019	97	8	-2307	126	11
7!007	364	1	3	1381	56	1	889	23	1	-731	15	1	1053	33	2	-2833	236	17
8!008	362	1	4	1721	72	1	-2840	195	[redacted]	-1062	27	2	1666	67	5	-147	1	0
9!009	339	1	3	938	25	0	-815	17	1	-2719	190	12	1875	91	7	759	15	1
10!010	296	1	6	-491	2	0	-1116	19	2	-4253	274	29	-59	0	0	-183	1	0
11!011	250	1	2	1209	41	1	-1335	30	3	-1060	31	2	1176	39	3	-1578	70	5
12!012	375	1	5	-1733	57	1	-2179	85	7	-3482	217	19	293	2	0	-818	12	1
13!013	461	1	5	-735	10	0	-2135	32	6	-4111	304	27	-87	0	0	1889	64	8
14!014	429	1	6	-1516	35	1	-2555	98	9	-3528	187	20	1671	42	5	-2106	67	10
15!015	369	1	3	1911	99	1	-1523	63	3	293	2	0	2438	161	12	-1260	43	3
16!016	532	1	7	-4905	215	7	-2087	58	6	-4819	311	37	1695	39	6	-793	8	1
17!017	440	1	5	-3592	221	5	13	0	0	-1947	65	6	1310	29	3	-2688	124	16
18!018	164	1	4	-497	6	0	-2037	96	6	-59	0	0	1674	65	6	142	0	0
19!019	359	1	5	-538	5	0	33	0	0	-2957	145	14	2644	116	14	-2363	93	12
20!020	257	1	7	-2047	53	2	-542	4	0	-2344	70	9	-3176	129	20	317	1	0
21!021	539	1	9	-4141	191	7	-2113	50	6	-3746	156	22	349	1	0	379	2	0
22!022	401	1	7	-1503	43	1	1944	50	5	-2024	54	6	454	3	0	-4374	252	41
23!023	346	1	32	*****	794	[redacted]	-784	2	1	3670	37	21	-2139	12	9	614	1	1
24!024	278	1	3	-1344	47	1	-2237	131	7	887	21	1	727	14	1	1594	66	5
25!025	351	1	3	-552	10	0	-329	3	0	2451	192	10	2327	173	11	317	3	0
26!026	247	1	5	-743	1	0	-79	0	0	-2649	132	11	1835	63	7	1636	50	6
27!027	609	1	10	-6492	394	17	774	5	1	-4215	162	28	-2235	46	10	-1157	12	3
28!028	739	1	36	*****	687	[redacted]	-1308	5	2	1931	11	6	-3063	28	18	-1602	8	6
29!029	153	1	4	1402	46	1	-494	6	0	-1880	82	6	812	15	1	405	4	0
30!030	456	1	4	-406	4	0	-2820	139	[redacted]	-3100	229	15	-197	1	0	-745	13	1
31!031	325	1	4	1182	30	1	-1	0	0	-2258	111	8	2922	186	17	145	0	0
32!032	115	1	3	324	4	0	-1962	107	5	46	0	0	394	4	0	-58	0	0
33!033	587	1	5	-3214	180	4	-2478	107	9	-2783	135	12	654	7	1	3000	157	19
34!034	532	1	7	-531	3	0	-2093	128	6	150	1	0	2065	124	8	1558	71	5
35!035	224	1	4	2436	137	2	-1943	87	5	-96	0	0	-267	2	0	-608	9	1
36!036	327	1	3	2592	241	3	-395	6	0	-1137	45	2	392	6	0	-881	28	2
37!037	120	1	4	656	12	0	-1861	35	5	-527	7	0	-342	3	0	751	14	1
38!038	538	1	7	1951	109	2	-2509	134	9	-376	4	0	-960	27	2	-420	5	0
39!039	252	1	7	-1519	71	1	339	4	0	1400	60	3	1610	80	5	1179	43	3
40!040	282	1	5	47	0	0	930	16	1	-991	13	2	3724	249	27	595	6	1
41!041	903	1	5	-3342	217	5	-2451	117	8	-1360	36	3	1832	65	7	2942	168	19
42!042	454	1	6	-3240	157	4	-3390	191	[redacted]	-100	0	0	-553	5	1	2602	101	15
43!043	319	1	3	67	0	0	-2695	264	[redacted]	-890	25	1	961	29	2	226	2	0
44!044	527	1	5	2464	263	2	-2319	233	8	-605	16	1	453	9	0	406	7	0
45!045	654	1	5	4001	539	7	-113	0	0	596	12	1	1629	89	5	-630	13	1
46!046	450	1	5	-2435	114	2	-1925	72	5	-3440	230	19	-433	4	0	1759	60	7
47!047	278	1	3	2281	140	2	-2635	137	[redacted]	300	2	0	1215	40	3	545	8	1
48!048	508	1	3	1793	132	1	-1629	109	4	-1178	57	2	480	9	0	-203	2	0
49!049	161	1	5	337	6	0	-704	9	1	-836	13	1	1377	36	4	1381	36	4
50!050	480	1	5	3696	325	5	-792	17	1	463	6	0	-755	15	1	-1301	45	4

Tableau 3.

Tableau 3. (suite)

	I1	OLT	POID	INF	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
	51	433	1	7	-4365	251	8	-1376	25	3	-1421	27	3	-1201	19	3	2908	111	18
	52	345	1	7	-4029	223	7	767	8	1	-2351	75	9	390	2	0	-1610	36	6
	53	456	1	2	1789	120	1	-2292	197	7	-1782	119	5	726	20	1	-149	1	0
	54	419	1	8	-5754	343	12	-2262	61	7	-63	0	0	-925	10	2	630	5	1
	55	279	1	6	-1341	26	1	-2106	64	6	-2867	119	13	435	3	0	2150	67	10
	56	101	1	5	-2090	76	2	-242	1	0	91	0	0	-288	1	0	1132	22	3
	57	777	1	16	*****	634	[redacted]	-2548	37	9	3023	53	14	2759	44	15	-1216	9	3
	58	703	1	16	*****	558	[redacted]	-1631	15	4	4211	93	28	2413	32	11	277	0	0
	59	827	1	16	*****	602	[redacted]	-3200	52	[redacted]	5411	147	46	1691	14	6	-1515	12	5
	60	809	1	16	*****	565	[redacted]	-2619	34	[redacted]	5180	132	42	2262	25	10	-3235	53	23
	61	751	1	17	*****	569	[redacted]	-2512	33	9	4106	83	27	2315	28	11	-2494	33	13
→	62	396	1	10	-5595	281	13	-489	2	0	2407	52	9	-1594	23	5	2043	37	9
	63	148	1	3	213	1	0	-1853	94	5	1116	34	2	773	16	1	239	2	0
	64	459	1	3	3389	361	5	-1030	33	1	766	13	1	-581	11	1	687	15	1
	65	416	1	4	1940	87	1	2422	150	8	235	1	0	2591	172	13	472	6	0
	66	526	1	3	3202	291	4	-949	26	1	523	3	0	-2548	185	13	-763	17	1
	67	631	1	3	3422	322	5	-738	15	1	2433	163	9	-2178	131	9	96	0	0
	68	343	1	4	-2212	105	2	2425	126	8	-729	11	1	2093	94	9	566	7	1
	69	344	1	2	533	12	0	-1312	73	2	448	3	0	-2210	206	10	1026	44	2
	70	613	1	8	-6144	412	15	2862	39	12	-821	7	1	2733	81	15	1473	24	5
	71	518	1	6	-2849	122	3	73	0	0	287	1	0	-3553	190	25	-610	6	1
	72	425	1	3	2941	243	3	565	10	0	733	17	1	-2210	150	10	-111	0	0
	73	279	1	4	2969	224	4	-1414	51	3	130	0	0	-373	4	0	-88	0	0
	74	513	1	3	3152	312	4	-2202	152	7	520	9	0	-1013	32	2	-498	8	1
	75	641	1	3	3722	493	6	-1787	114	4	612	13	1	-764	21	1	-28	0	0
	76	852	1	3	5254	711	11	-459	5	0	2287	135	8	154	1	0	-74	0	0
	77	46	1	2	93	0	0	-781	24	1	484	9	0	-28	0	0	563	13	1
	78	765	1	3	4900	630	10	-263	2	0	2148	121	7	-551	8	1	-403	4	0
	79	323	1	2	1302	75	1	-1780	140	4	860	33	1	-1159	59	3	643	18	1
	80	657	1	3	4559	624	9	-580	10	0	945	27	1	-730	16	1	-571	10	1
	81	504	1	5	306	2	0	-3064	159	13	-1670	53	4	-3132	176	19	-2442	107	13
	82	828	1	4	5357	617	12	-271	2	0	2640	153	11	1612	56	5	389	3	0
	83	326	1	2	-1045	41	0	253	2	0	617	14	1	-2454	225	12	-1073	43	2
	84	395	1	3	3506	316	5	136	0	0	1336	46	3	40	0	0	-1130	33	3
	85	129	1	2	798	23	0	-1231	55	2	512	10	0	-1055	41	2	-119	1	0
	86	520	1	3	4174	493	7	-388	4	0	1550	63	4	-391	4	0	-598	10	1
	87	226	1	3	1168	44	1	-233	2	0	1715	94	5	-1564	79	5	553	10	1
(M)	88	297	1	3	1931	115	2	313	3	0	894	25	1	-2180	146	9	522	8	1
	89	470	1	2	3126	332	4	-69	0	0	175	1	0	-947	35	2	-1153	52	3
	90	29	1	1	-407	10	0	50	0	0	366	3	0	53	0	0	-408	10	0
	91	570	1	3	3101	306	4	-1863	110	5	1051	35	2	-1923	118	7	139	1	0
	92	332	1	2	1903	137	1	-1917	138	5	1532	88	4	-252	2	0	655	16	1
	93	114	1	1	69	0	0	-1300	44	2	-926	22	1	-1127	33	3	754	15	1
	94	525	1	6	2354	253	2	-504	12	0	864	34	1	-2031	188	8	913	38	2
	95	171	1	3	622	11	0	337	3	0	209	1	0	-1739	87	6	-1542	68	5
	96	237	1	2	986	38	0	-1298	66	2	-1593	99	4	-885	31	2	-260	3	0
	97	239	1	5	1977	97	1	328	3	0	1932	103	6	-864	21	1	-745	15	1
	98	477	1	8	3883	344	6	-12	0	0	1995	94	6	673	11	1	1032	28	3
	99	299	1	4	1754	59	1	714	11	1	2574	143	10	-926	19	2	1668	62	6
	100	193	1	7	3695	381	6	-435	5	0	1863	97	5	300	3	0	1011	29	2

Tableau 3. (suite)

	I1	QLT	POID	INR	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
101	101	126	1	6	-1143	20	1	2330	83	8	-240	1	0	-237	1	0	-1233	23	3
102	102	55	1	4	130	0	0	1281	37	2	50	0	0	7	0	0	-883	17	2
103	103	359	1	4	3449	287	5	238	1	0	851	17	1	-53	0	0	1480	53	5
104	104	519	1	3	3483	378	6	85	0	0	1624	73	4	-432	5	0	1503	63	5
105	105	272	1	6	-436	3	0	2486	99	9	1150	21	2	-2135	73	9	2267	82	11
106	106	371	1	7	-1082	15	0	2956	113	12	-922	11	1	3221	134	20	-2742	97	16
107	107	101	1	4	81	0	0	1089	26	2	303	2	0	-1203	32	3	1333	40	4
108	108	222	1	4	-541	7	0	207	1	0	-2805	195	12	-578	8	1	639	10	1
109	109	259	1	4	2476	144	3	655	10	1	1072	27	2	-1163	32	3	1407	46	4
110	110	129	1	4	1251	37	1	1399	46	3	103	0	0	-2082	103	9	-308	2	0
111	111	324	1	4	1251	74	1	205	1	0	1748	65	5	-2579	144	13	1316	38	4
112	112	128	1	5	575	6	0	587	6	0	-529	5	0	-1883	63	7	1665	49	6
113	113	132	1	4	312	2	0	-316	2	0	433	4	0	-2591	151	13	992	22	2
114	114	447	1	3	3504	391	5	22	0	0	842	22	1	-80	0	0	1188	44	3
115	115	169	1	3	-1123	37	1	1203	42	2	184	1	0	-498	7	0	-1669	81	6
116	116	321	1	7	1641	74	1	2050	116	6	-1254	43	2	-986	27	2	-1487	61	5
117	117	221	1	5	-2459	120	2	2130	90	6	-437	4	0	114	0	0	637	8	1
118	118	154	1	5	-1067	19	0	1795	54	5	-137	0	0	533	5	1	-2150	77	10
119	119	347	1	5	-3100	162	4	2844	136	[redacted]	-1516	39	4	-722	9	1	-262	1	0
120	120	198	1	5	-439	4	0	2975	171	[redacted]	34	0	0	-815	13	1	-248	1	0
121	121	266	1	5	-2632	113	3	2827	131	[redacted]	-889	13	1	-318	2	0	236	1	0
122	122	210	1	5	1341	33	1	1623	48	4	-684	3	1	-885	14	2	2429	107	13
123	123	266	1	3	-276	2	0	2166	146	7	1101	38	2	445	6	0	-672	14	1
124	124	325	1	4	-70	0	0	2679	166	[redacted]	-458	5	0	1294	39	3	2235	116	11
125	125	327	1	5	529	5	0	2696	139	[redacted]	1443	40	3	51	0	0	2725	142	16
126	126	392	1	4	540	7	0	3301	254	[redacted]	230	1	0	-523	6	1	2299	123	11
127	127	470	1	5	196	1	0	3790	279	[redacted]	-1146	25	2	-29	0	0	2909	165	18
128	128	389	1	4	673	9	0	3314	224	[redacted]	988	20	2	971	19	2	2384	116	12
129	129	164	1	4	-307	2	0	1896	90	5	-140	0	0	858	18	1	1436	51	4
130	130	260	1	3	1864	94	1	1104	32	2	-132	0	0	288	2	0	2229	131	11
131	131	306	1	5	-1272	29	1	3833	257	[redacted]	108	0	0	157	0	0	679	8	1
132	132	599	1	3	3027	265	4	1857	100	5	688	14	1	1633	77	5	2224	143	11
133	133	457	1	4	-1612	60	1	3122	226	[redacted]	915	19	1	1380	44	4	2160	108	10
134	134	389	1	4	-592	17	0	3074	203	[redacted]	-1325	33	3	1432	44	4	2005	87	9
135	135	275	1	5	-1705	19	0	3507	228	[redacted]	-207	1	0	-1079	22	2	570	6	1
136	136	591	1	6	-3252	154	4	5402	424	[redacted]	-389	2	0	797	9	1	-401	2	0
137	137	460	1	5	1395	21	0	4117	298	[redacted]	-1289	29	3	2025	72	8	1506	40	5
138	138	476	1	3	189	1	0	2615	191	[redacted]	-2344	154	9	1180	39	3	1804	91	7
139	139	353	1	5	609	7	0	3030	133	[redacted]	-746	11	1	-676	9	1	2675	142	15
140	140	332	1	4	509	15	0	2370	126	8	-947	20	1	2725	167	15	654	10	1
141	141	428	1	6	-1024	15	0	-1956	56	5	3980	230	25	1864	51	7	2288	76	11
142	142	396	1	4	-970	22	0	3821	336	[redacted]	824	15	1	-252	1	0	-961	21	2
143	143	335	1	4	-3082	207	4	1917	30	5	-456	5	0	439	4	0	1324	38	4
144	144	522	1	6	-953	14	0	5481	450	[redacted]	-1630	40	4	-485	4	0	987	15	2
145	145	355	1	4	3679	305	6	279	2	0	1599	53	4	20	0	0	-144	0	0
146	146	410	1	3	-1762	54	1	-2476	174	9	-2237	142	8	-829	19	1	867	21	2
147	147	266	1	4	1702	64	1	1639	59	4	-422	4	0	-1204	32	3	-2196	106	10
148	148	67	1	3	372	3	0	-516	10	0	-42	0	0	-1123	49	2	-339	4	0
149	149	133	1	3	-146	22	0	-165	1	0	-1690	89	5	412	5	0	-697	15	1
150	150	362	1	7	1245	42	1	243	2	0	-842	19	1	-2235	132	10	-2566	174	14

Tableau 3. (suite)

I	I1	QLT	POID	INR	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
151	151	164	1	5	1264	30	1	-1255	30	2	-2005	75	6	-1124	24	2	-448	4	0
152	152	400	1	7	-4132	226	7	-789	8	1	-1386	25	3	-2510	84	12	2057	56	9
153	153	191	1	4	241	1	0	-402	4	0	-1854	81	5	-2002	94	8	-232	1	0
154	154	220	1	4	644	10	0	246	1	0	-1176	32	2	-537	7	1	-2713	170	16
155	155	245	1	3	2356	147	2	112	0	0	286	2	0	-646	11	1	-1789	85	7
156	156	511	1	2	3476	449	5	384	5	0	-182	1	0	-960	34	2	-764	22	1
157	157	201	1	4	-2001	165	3	1771	66	4	-11	0	0	26	0	0	-1534	50	5
158	158	48	1	4	-189	1	0	-290	2	0	-510	5	0	1105	30	2	620	9	1
159	159	492	1	10	-5943	239	10	4621	201	30	-2187	45	8	-833	7	1	-130	0	0
160	160	428	1	2	2941	314	4	105	0	0	1581	91	4	782	22	1	-99	0	0
161	161	315	1	7	-3503	160	5	683	6	1	2315	70	8	-2461	79	12	183	0	0
162	162	322	1	2	1616	98	1	-550	11	0	-1436	78	3	-1840	127	7	-431	7	0
163	163	510	1	3	-606	10	0	2013	111	6	1995	109	6	-171	1	0	1704	80	6
164	164	267	1	7	-1319	23	1	2607	91	10	-371	2	0	-1033	14	2	-3177	136	22
165	165	594	1	2	3390	469	5	437	8	0	1447	85	3	665	18	1	302	4	0
166	166	519	1	6	-4448	280	8	1227	21	2	-813	9	1	-3254	150	21	-2042	59	9
167	167	407	1	4	-1617	59	1	2465	138	9	-1061	25	2	-2061	96	8	-1968	88	8
168	168	234	1	3	3044	243	4	-270	2	0	55	0	0	-1097	32	2	526	7	1
169	169	431	1	2	-1556	88	1	798	23	1	1456	77	3	-2486	226	12	-669	16	1
170	170	277	1	4	2754	177	3	833	16	1	1511	53	4	48	0	0	-1145	31	3
171	171	489	1	3	2152	162	2	947	31	1	-190	1	0	-2532	225	13	-1403	69	4
172	172	472	1	4	-1913	79	2	2424	126	8	843	15	1	-2813	170	16	-1946	81	8
173	173	465	1	3	3780	334	4	-631	14	1	-570	12	1	-577	12	1	-1071	41	2
174	174	423	1	2	-1420	76	1	1189	53	2	1400	74	3	-88	0	0	2423	221	13
175	175	410	1	2	1864	140	1	-1146	53	2	-669	13	1	-2214	197	10	254	3	0
176	176	360	1	3	2304	136	2	-529	10	0	425	5	0	-983	34	2	-1886	124	8
177	177	617	1	2	3185	408	4	14	0	0	194	2	0	-1769	144	6	-274	3	0
178	178	241	1	2	-1665	112	1	243	2	0	1076	47	2	-515	11	1	1294	68	4
179	179	387	1	4	1297	27	0	2385	129	8	1204	33	2	-740	12	1	-2870	186	18
180	180	565	1	4	-1705	37	1	1649	59	4	120	0	0	2356	121	11	-2597	147	14
181	181	720	1	3	4042	524	7	-1575	80	3	1245	50	2	1395	62	4	-368	4	0
182	182	721	1	3	4133	565	7	-1118	40	2	895	25	1	1660	89	5	-157	1	0
183	183	410	1	2	2639	275	3	-1506	90	3	783	24	1	721	21	1	-52	0	0
184	184	325	1	3	3116	295	4	30	0	0	-547	9	0	518	8	1	-863	23	2
185	185	431	1	2	3890	545	6	-1033	38	2	993	35	2	556	11	1	127	1	0
186	186	157	1	4	-950	19	0	253	2	0	213	1	0	-2371	134	11	-210	1	0
187	187	562	1	3	4079	520	7	-1060	35	2	77	0	0	316	3	0	315	3	0
188	188	273	1	6	1405	29	1	1422	30	3	2053	62	7	789	9	1	-3099	142	21
189	189	211	1	4	-750	13	0	-316	2	0	-988	22	2	2795	174	15	-119	0	0
190	190	510	1	3	3716	426	6	-63	0	0	961	27	1	1376	56	4	17	0	0
191	191	232	1	3	1344	64	1	-174	1	0	2085	153	7	271	3	0	-575	12	1
192	192	[illegible]	1	7	-3062	130	4	989	14	1	3728	192	22	1721	41	6	1557	33	5
193	193	378	1	2	2354	204	2	-1451	78	3	1003	37	2	1067	42	2	-559	17	1
194	194	157	1	4	1527	49	1	-1825	70	5	487	5	0	617	8	1	1090	25	3
195	195	417	1	2	2337	250	2	-342	5	0	1171	62	2	1488	100	4	114	1	0
196	196	517	1	4	-566	3	0	2629	142	10	3043	190	15	2551	134	13	1530	48	5
197	197	203	1	4	755	14	0	-1201	36	2	-995	25	2	-1127	32	3	-1970	97	8
198	198	704	1	3	4474	629	8	-306	3	0	1289	52	3	633	13	1	-487	7	1
199	199	126	1	7	2739	152	2	616	11	1	-848	20	1	321	3	0	244	2	0
200	200	220	1	8	[illegible]	0	0	-2487	106	9	-1257	27	3	-1454	36	4	1721	51	0

Tablau 3. (suite)

	I1	QLT	POID	INR	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
201	201	429	1	3	268	2	0	2566	210	9	-1342	53	3	1605	82	5	-1547	77	5
202	202	703	1	8	-6292	444	16	-1911	41	5	-97	0	0	-2256	57	10	3795	161	31
203	203	278	1	2	1535	93	1	-1743	120	4	-693	19	1	747	22	1	-735	24	1
204	204	385	1	3	3262	292	4	-219	1	0	142	1	0	329	3	0	-1782	87	7
205	205	212	1	2	-687	17	0	-2091	159	6	795	23	1	346	4	0	474	8	0
206	206	108	1	5	-1528	46	1	-536	6	0	-293	2	0	-1662	55	5	-79	0	0
207	207	257	1	5	3167	173	4	-681	8	1	1302	29	3	1507	39	4	-626	7	1
208	208	414	1	3	1424	67	1	-374	25	1	2266	171	8	1589	84	5	-1415	67	4
209	209	367	1	3	2519	182	3	-2109	127	6	-1185	43	2	-104	0	0	-771	17	1
210	210	66	1	4	-1048	24	0	-1225	33	2	-555	7	0	-166	1	0	268	2	0
211	211	421	1	4	2480	136	3	-2844	178	11	-620	8	1	1301	37	3	1670	62	6
212	212	501	1	3	3371	363	5	-249	2	0	343	4	0	549	10	1	-1959	123	8
213	213	376	1	6	-3486	179	5	2689	107	10	317	1	0	-959	14	2	-2243	74	11
214	214	311	1	1	1814	201	1	-44	0	0	645	25	1	-528	17	1	-1049	67	2
215	215	323	1	3	2783	252	3	-597	12	1	1179	45	2	47	0	0	667	14	1
216	216	269	1	6	3	0	0	-646	6	1	3157	152	16	-2104	67	9	-1698	44	6
217	217	186	1	4	2012	103	2	823	17	1	985	25	2	-1194	36	3	410	4	0
218	218	131	1	5	930	16	0	1197	27	2	-707	9	1	1940	71	7	-648	8	1
			213.0	1000			1000			1000			1000			1000			1000

Tableau 4.

J1	QLT	POID	INH	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
A1	259	1	20	428	193	16	105	11	3	-155	24	8	202	41	17	-12	0	0
A2	140	1	20	166	28	2	309	95	29	-23	1	0	125	16	7	-35	1	1
A3	212	1	20	-43	2	0	-302	91	28	-45	2	1	264	70	30	-218	47	22
A4	361	1	20	492	242	22	0	0	0	-59	4	1	-147	21	9	307	94	44
B1	501	1	20	559	313	28	249	62	19	27	1	0	-327	107	46	139	19	9
B2	478	1	20	603	364	33	85	7	2	-316	100	34	-70	5	2	49	2	1
B3	433	1	20	518	268	24	-269	72	22	-40	2	1	-71	5	2	293	86	40
B4	553	1	20	472	223	20	-565	319	98	1	0	0	83	7	3	-68	5	2
C1	595	1	20	601	361	32	144	21	6	-409	167	58	-76	6	2	200	40	19
C2	517	1	20	549	302	27	66	4	1	-323	104	36	153	23	10	288	83	39
C3	510	1	20	515	269	24	-185	34	11	58	3	1	-66	4	2	447	200	93
C4	492	1	20	471	222	20	-52	3	1	-119	14	5	490	240	103	116	13	6
C5	565	1	20	520	271	24	223	50	15	235	55	19	-61	4	2	-78	6	3
C6	494	1	20	483	234	21	319	102	31	305	93	32	143	21	9	211	45	21
C7	556	1	20	573	143	13	343	118	36	431	186	64	-175	31	13	281	79	37
C8	437	1	20	121	15	1	167	28	9	135	18	6	575	331	142	213	46	21
C9	448	1	20	-6	0	0	-156	24	8	227	51	18	507	368	158	65	4	2
C10	387	1	20	412	169	15	-118	14	4	438	192	66	-105	11	5	27	1	0
D1	575	1	20	X670	449	40	262	69	21	-136	13	6	88	8	3	-178	32	15
D2	417	1	20	392	153	14	-54	3	1	307	94	33	31	1	0	-407	166	77
D3	512	1	20	X538	345	31	328	107	33	-27	1	0	130	17	7	-204	41	19
D4	574	1	20	523	274	24	439	193	59	108	12	4	297	88	38	-84	7	3
D5	232	1	20	280	78	7	326	106	33	63	4	1	205	42	18	-37	1	1
D6	302	1	20	207	43	4	-188	35	11	-164	27	9	444	197	85	-7	0	0
E1	343	1	20	347	121	11	2	0	0	306	94	32	313	98	42	-174	30	14
E2	433	1	20	514	264	24	287	82	25	250	63	22	153	23	10	34	1	1
E3	439	1	20	572	327	29	126	16	5	-121	15	5	-286	82	35	-10	0	0
E4	502	1	20	X632	399	36	246	60	19	-78	5	2	-191	36	16	16	0	0
E5	457	1	20	531	282	25	-191	37	11	-100	10	3	98	10	4	-345	119	56
E6	441	1	20	537	289	26	-300	90	28	-128	15	6	213	46	20	-20	0	0
E7	538	1	20	511	261	23	-468	219	67	-102	10	4	208	43	19	65	4	2
E8	396	1	20	452	204	18	243	59	18	296	88	30	122	15	6	-173	30	14
E9	403	1	20	520	270	24	-26	1	0	332	110	38	-126	16	7	75	6	3
E10	394	1	20	413	175	16	-427	132	56	112	13	4	-141	20	9	-63	4	2
E11	447	1	20	559	311	28	-24	1	0	-348	121	42	-118	14	6	-43	2	1
E12	653	1	20	X612	375	33	229	53	16	-425	181	62	-161	26	11	-137	19	9
E13	434	1	20	446	199	13	-71	5	2	-368	135	47	-9	0	0	-306	94	44
F1	314	1	20	414	172	15	-180	32	10	292	85	29	-258	66	29	-398	159	74
F2	457	1	20	456	190	17	-71	5	2	317	101	35	-284	81	35	-284	81	38
F3	273	1	20	313	101	9	96	9	3	130	32	11	-130	17	7	-462	214	100
F4	445	1	20	X616	330	34	82	7	2	-236	56	19	19	0	0	51	3	1
F5	435	1	20	511	261	23	-349	121	37	189	35	12	-35	1	1	188	35	17
F6	381	1	20	266	71	6	-482	233	71	-144	21	7	48	2	1	-233	54	25
F7	149	1	20	232	54	5	-278	77	24	-42	2	1	-99	10	4	79	6	3
F8	470	1	20	387	150	13	-381	145	45	355	126	43	-60	4	2	214	46	21
F9	528	1	20	326	149	13	-330	109	33	431	186	64	-92	8	4	276	76	36
F10	492	1	20	X640	410	37	110	12	4	-243	59	20	-105	11	5	13	0	0
G1	323	1	20	476	227	20	-260	67	21	-93	9	3	-143	20	9	-1	0	0
G2	224	1	20	434	136	17	157	25	8	320	102	35	32	1	0	94	9	4
G3	315	1	20	423	179	16	-109	12	4	58	3	1	126	16	7	-324	105	49

Tableau 4. (suite)

	JI	ALT	POID	INP	1#F	COR	CTR	2#F	COR	CTR	3#F	COR	CTR	4#F	COR	CTR	5#F	COR	CTR
51	G4	330	1	20	486	236	21	-170	29	9	-210	44	15	-12	0	0	143	21	10
			31.0	1000			1000			1000			1000			1000			1000

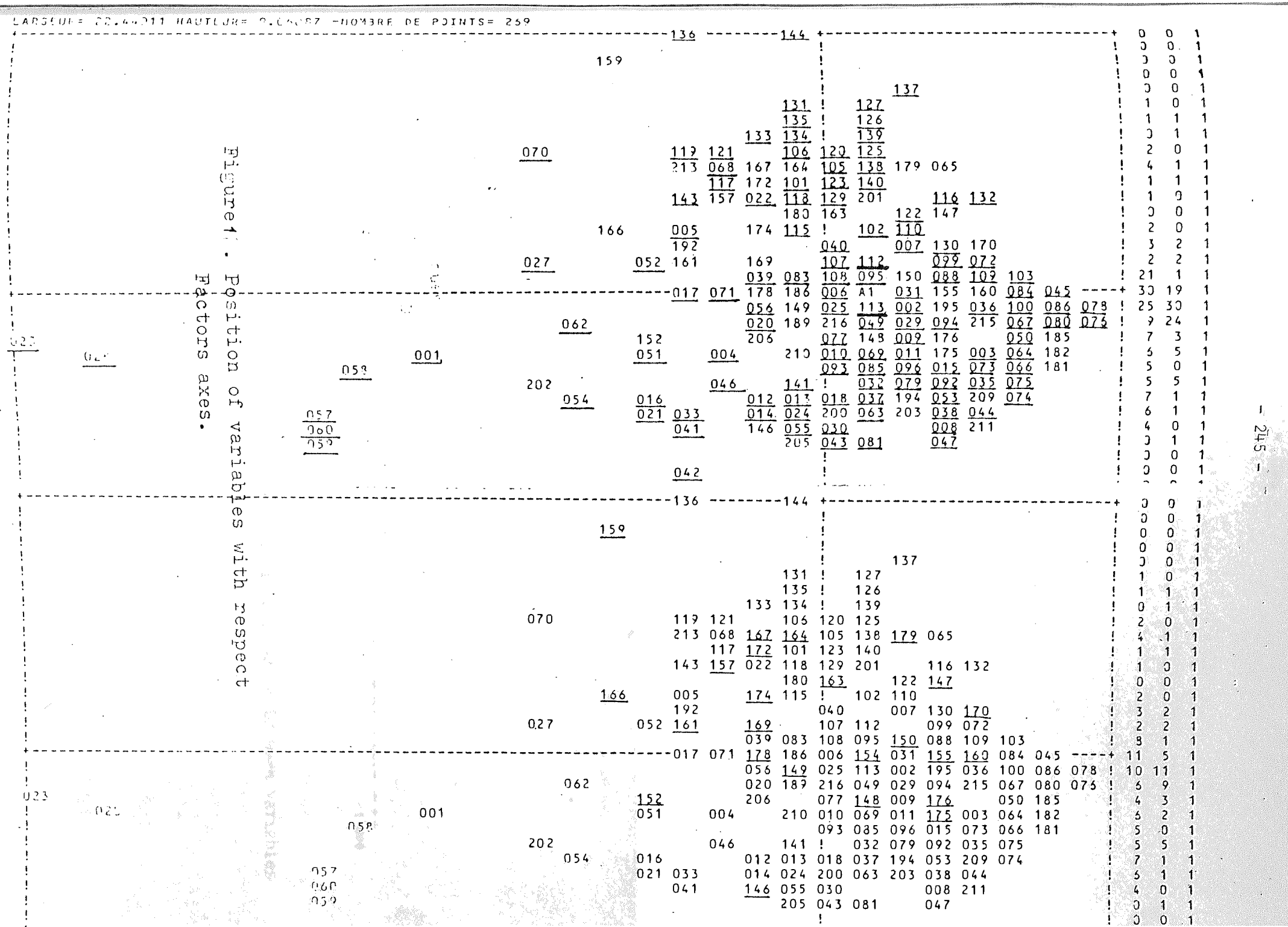


Figure 1. Position of variables with respect Factors axes.

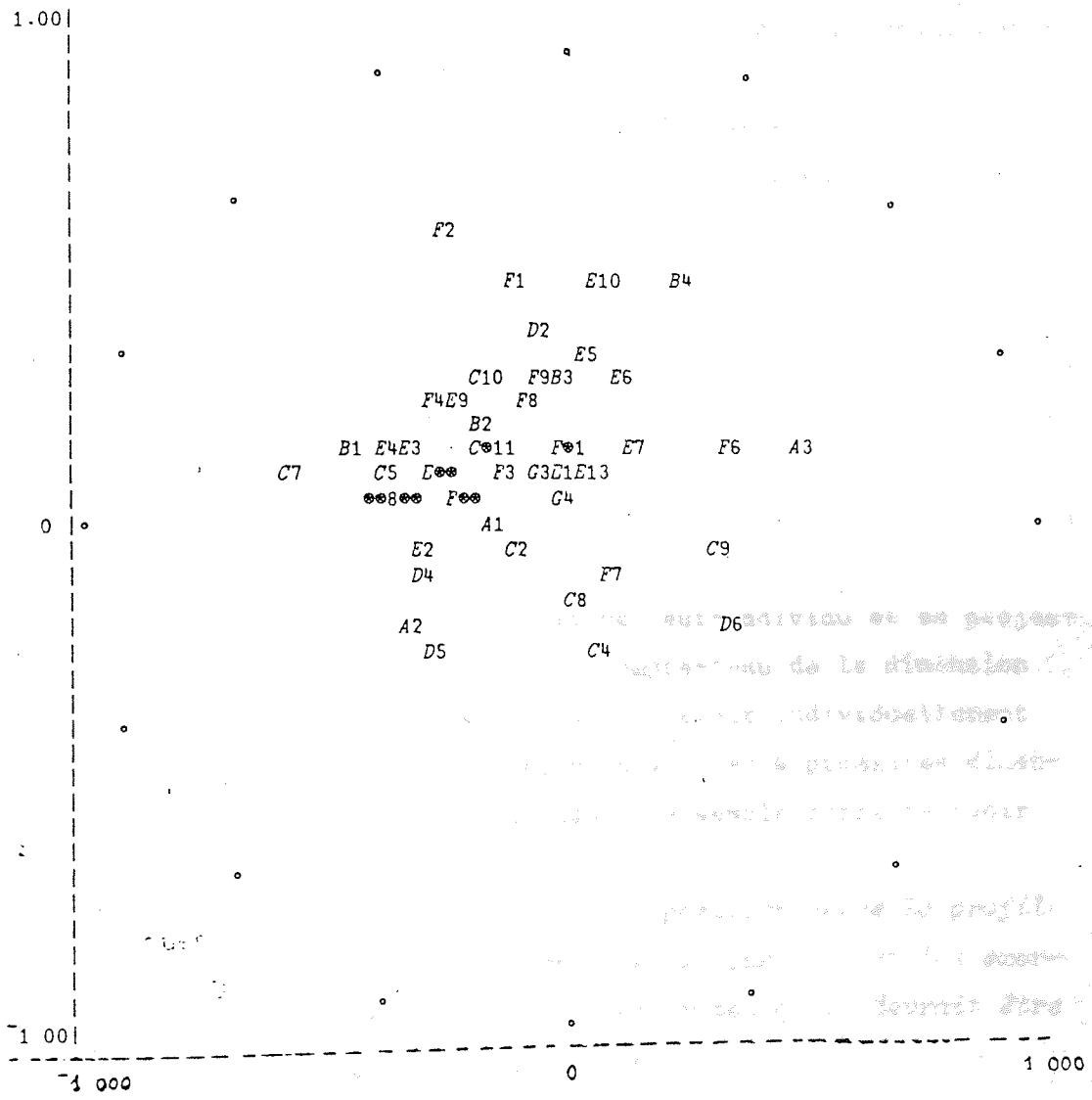


Figure 2. Circle of correlation between variables

pas très élevés car les dimensions du tableau des données sont importantes. Nous conserverons a priori les 4 premières valeurs propres (38 % de la variance totale) pour calculer les coordonnées des individus (001 à 218) et des variables (A1 à G4). Ces résultats figurent en totalité aux tableaux n°3 et 4, mais, ne considérant cette A.C.P que comme une analyse préliminaire, nous nous contenterons d'examiner les deux premières dimensions en exploitant le plan factoriel 1-2 (fig. 1), le cercle des corrélations correspondant (Fig. 2) tout en consultant la matrice de même nom (tableau n°1).

Nous chercherons tout d'abord à caractériser les axes 1-2 en cherchant quels sont les individus qui y contribuent le plus. L'examen du tableau n° 3 nous montre que ce sont les individus du groupe "Techniciens" qui ont les plus fortes contributions. La figure 1 précise que cette catégorie se positionne en opposition à l'agrégat des autres catégories profesionnelles relativement à l'axe 1. La figure obtenue étant une projection il ne faut pas confondre proximités sur le plan principal et proximités dans l'espace IR 51, une erreur de perspective étant toujours possible. Il est donc nécessaire en théorie de contrôler la qualité de la représentation des points-individus concernés. Ceci se fait en considérant le carré du cosinus de l'angle formé par le vecteur-individu et sa projection sur le plan(voir tableau n° 3). Ici compte-tenu de la dimension importante (51) du tableau, il est normal d'obtenir individuellement des valeurs médiocres pour chaque axe, mais sur les 4 premières dimensions cumulées, la qualité totale est dans l'ensemble correcte (voir colonne C1 LT du tableau 3).

En résumé, l'axe 1 traduirait *une certaine opposition entre le profil des activités des techniciens de sécurité telles que ceux-ci les exercent actuellement et la conception de ce métier tel qu'il devrait être selon les autres catégories professionnelles.*

Remarques : * Les considérations précédentes ne sont valables que si les individus représentent un intérêt par eux-mêmes. Ce qui n'est pas le cas ici en toute rigueur, où les individus sont anonymes et n'ont d'intérêt que considérés dans leur ensemble, que par leur groupement en catégories professionnelles et non par leur individualité.

* On remarque de plus que certains d'entre eux contribuent de façon trop importante (ex : individus n° 23 et 28) à la formation de l'axe factoriel n° 1. Cela peut constituer un handicap et il aurait été préférable

de les éliminer de cette formation et de ne les faire figurer sur le graphique qu'en points supplémentaires.
Compte-tenu de ces remarques la consultation du cercle des corrélations semble primordiale (fig. 2). Nous voyons que pratiquement tous les points variables sont du même côté de l'origine. Ceci traduit le fait que la plupart de ces variables sont corrélées positivement entre elles et que c'est bien par rapport à *l'ensemble des réponses données au questionnaire* que les techniciens s'opposent aux autres catégories.

L'interprétation que nous allons faire de l'axe n° 2 semble corroborer nos premières conclusions en les précisant.

La figure 1 montre en effet que l'opposition inter-catégories la plus nette concerne la paire "CRAM-Techniciens". Cette différence de conception du rôle du technicien de sécurité s'est faite, rappelons-le, en se référant à des tâches bien typées, comme le montre le cercle des corrélations. On y constate que la composante principale n° 2 (verticale) est relativement bien (voir remarque suivante) corrélée positivement avec les variables B1, C5, C6, C7, D1, D3 et D4 entre autres, et négativement avec des variables telles que B4, E6, E7, F5, F6 et F8.

Un retour sur la fiche du questionnaire nous permet, grâce à l'intitulé explicite des différentes questions, de vérifier que les variables du premier groupe caractérisent des tâches nécessitant des connaissances techniques dans des domaines parfois "pointus" (C5, D3 par exemple), alors que celles du second groupe ont trait à des tâches plus classiques et de portée moindre, telles que l'élaboration et la rédaction de consignes de sécurité (B4 et E7) ou relatives à des équipements de protection individuelle (E6 et F8).
On remarquera que les tâches ainsi groupées séparément ne se situent pas au même niveau. Celles du second groupe se situant plus en aval, en ce sens qu'elles peuvent ne constituer que l'ultime étape d'analyses globales de sécurité prises en compte dans le premier groupe.
Ceci nous conduit à interpréter l'axe factoriel 2 comme celui d'une certaine *hiérarchie des tâches de sécurité*, ce terme n'impliquant aucune échelle de valeurs. Si cette interprétation est retenue, Force est de constater (figure 1) que dans leur majorité les techniciens de sécurité restreignent de fait leurs activités à des domaines particuliers, alors que les agents des C.R.A.M souhaiteraient les voir s'attacher à résoudre en priorité des problèmes d'ordre plus général requerant une technicité plus élaborée.

Remarques :

* Comme le montre la figure 1, les quatre autres catégories professionnelles (Médecins du Travail, Inspection du Travail, Employeurs et Enseignants en H.S) occupent des positions médianes et imbriquées.

* Une précaution à prendre avant de développer l'argumentation précédente a été de vérifier qu'il y avait dans l'ensemble une assez bonne corrélation intra-groupe et une corrélation inter-groupes moins nette (voir le tableau n°1).

* A ce propos, il faut noter que ces corrélations et les corrélations entre les variables initiales et les composantes principales ne pouvaient être meilleures du fait de la dispersion due au nombre important de ces variables.

La dernière observation que nous ferons concerne le pouvoir discriminant de l'ACP mise en oeuvre. Celui-ci apparaît clairement sur la figure 3 où l'on a projeté, en individus supplémentaires, sur le plan factoriel 1-2 les centres de gravités des six catégories profesionnelles consultées. On constate que cette discrimination est plus nette suivant l'axe 2.

4-1-Analyse discriminante -

Comme suite logique de l'ACP précédente qui a, comme nous venons de le voir, défini une partition des individus en 3 classes disjointes (Techniciens, CRAM et le groupe MED-INSP-EMPLOYEURS-ENSEIGNANTS), nous avons effectué une analyse discriminante des mêmes données brutes.*
Une première confirmation de la partition précédente a été donnée par le tableau des carrés des distances (D2 de Mahalanobis) séparant les centres de gravité des 6 catégories professionnelles prises 2 à 2 (tableau n° 6). On y voit se préciser une nouvelle partition plus fine due à la scission de la classe hétérogène précédente en deux sous-classes distinctes : "MED-INSP" et "EMPLOYEURS-ENSEIGNANTS", cette dernière sous la dénomination "PATRONS-I.U.T.".
Cette nouvelle partition étant à notre avis d'autant plus significative que les différentes classes sont plus homogènes et groupées autour de leur centre de gravité. Dans ce but l'affectation des individus aux 4

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* Cette analyse n'a été rendue possible que grâce au concours de J.P. PAGES et de ses collaborateurs. Nous les en remercions vivement.

Tableau 6 : Affectation des individus.

DISTANCES ENTRE CENTRE DE GRAVITE

DESIREZ VOUS CALCULER LE TABLEAU DES DISTANCES ENTRE CENTRES DE GRAVITE ? METRIQUE W¯1)
O
LE TABLEAU DES CARRES DES DISTANCES EST CONTENU DANS DIST

DESIREZ -VOUS L'IMPRESSION DU TABLEAU DES CARRES DES DISTANCES ?
OUI

	TECH	MEDE	CRAM	INSP	IUT	PATR
TECH	0000					
MEDE	16 5010	.0000				
CRAM	26 4412	17 2199	.0000			
INSP	16 5230	4 8763	16 3552	0000		
IUT	11.1584	7 1421	20 0959	9.7626	0000	
PATR	10 0577	7.9867	25.2593	10 0082	6 8923	0000

COMPARAISON DES CENTRES DE GRAVITE:T2 DE HOTELLING

groupes ainsi constitués a été demandée. Afin de réduire ou de supprimer le biais inhérent à toute affectation se faisant sur l'échantillon de base, nous avons eu recours à la technique du "JACKKNIFE" qui, dans notre cas, établit qu'il y a pratiquement 60 % d'individus bien classés (si cette affectation était due au seul hasard, il n'y aurait que 25 % d'individus bien classés).
On peut en conclure que les 4 groupes nouvellement discriminés sont homogènes et bien séparés, ainsi que le montrent les figures 8 à 9.

4-2-Analyse factorielle des correspondances -

Cette analyse a permis d'étudier en détail phase par phase toutes les convergences et divergences entre les six catégories d'acteurs.
Nous donnons ici le traitement complet relatif à la phase analyse (D) ; l'interprétation a été effectuée comme suit :
Les deux axes du graphique explique 96 % de la variance totale. L'axe horizontal est déterminé par D2, D5, D6 et aussi par T et C. Il explique en grande partie la différence de conception de l'activité analyse dans la fonction sécurité, chez les hommes de sécurité (T) d'une part et chez les autres acteurs d'autre part. Compte-tenu de la nature de la tâche D6 par rapport à D3 et D4 par exemple nous pouvons dire que l'axe horizontal explique la technicité de la fonction sécurité. En effet on retrouve d'une part les Techniciens et Ingénieurs (T) autour de l'activité prédominante qui est l'interprétation de la réglementation (D6), et d'autre part les autres acteurs autour des activités plus techniques comme l'évaluation du potentiel du danger, les probabilités du risque etc...
L'axe vertical est déterminé par les acteurs (T, C et M), la position des tâches par rapport à cet axe traduit la nature du rôle de l'homme de sécurité par rapport à ces tâches. Nous avons d'une part (D2) qui indique un acte opérationnel et pratique de la part de l'homme de sécurité, d'autre part (D5) indique que ce dernier fait faire ce type d'analyse par un organisme extérieur.
La position des CRAM (C) par rapport à cette question est logique, elle traduit le fait qu'ils sont parmi les organismes débiteurs de ces analyses d'expertise. La position des techniciens et ingénieurs confirme simplement leur pratique actuelle.

CE PROGRAMME VOUS PERMET DE FAIRE UNE AFC SUR VOS PROPRES DONNEES

VOUS DEVEZ POUR CELA PARTIR D'UN TABLEAU DE CONTINGENCE (TRI CROISE D'UNE POPULATION SELON DEUX CARACTERES) OBLIGATOIREMENT VERTICAL

PROGRESSION PAR BARRE D'ESPACEMENTNOM DU TABLEAU? ANA LYSIS

NOMBRE DE LIGNES DU TABLEAU? 6

NOMBRE DE COLONNES DU TABLEAU? 6

VOS DONNEES DOIVENT-ELLES ETRE NORMALISEES AVANT TRAITEMENT (répondre par OUI ou NON)? NON

DESIGNATION DU VECTEUR-COLONNE? T

COLONNE N° 1

FREQUENCE N° 1 =? 2209
FREQUENCE N° 2 =? 1838
FREQUENCE N° 3 =? 1677
FREQUENCE N° 4 =? 1629
FREQUENCE N° 5 =? 1548
FREQUENCE N° 6 =? 2500

CORRECT ? SI OUI RETURN - SINON ESC.
DESIGNATION DU VECTEUR-COLONNE? M

COLONNE N° 2

FREQUENCE N° 1 =? 2750
FREQUENCE N° 2 =? 2557
FREQUENCE N° 3 =? 2730
FREQUENCE N° 4 =? 2057
FREQUENCE N° 5 =? 1750
FREQUENCE N° 6 =? 1711

CORRECT ? SI OUI RETURN - SINON ESC.
DESIGNATION DU VECTEUR-COLONNE? C

COLONNE N° 3

FREQUENCE N° 1 =? 2766
FREQUENCE N° 2 =? 1500
FREQUENCE N° 3 =? 2700
FREQUENCE N° 4 =? 2666
FREQUENCE N° 5 =? 2633
FREQUENCE N° 6 =? 1833

CORRECT ? SI OUI RETURN - SINON ESC.
DESIGNATION DU VECTEUR-COLONNE? I

COLONNE N° 4

FREQUENCE N° 1 =? 2657
FREQUENCE N° 2 =? 2257
FREQUENCE N° 3 =? 2542
FREQUENCE N° 4 =? 2114
FREQUENCE N° 5 =? 2000
FREQUENCE N° 6 =? 1457

CORRECT ? SI OUI RETURN - SINON ESC.
DESIGNATION DU VECTEUR-COLONNE? E

COLONNE N° 5

FREQUENCE N° 1 =? 2900
FREQUENCE N° 2 =? 2650
FREQUENCE N° 3 =? 2700
FREQUENCE N° 4 =? 2450
FREQUENCE N° 5 =? 2300
FREQUENCE N° 6 =? 2250

CORRECT ? SI OUI RETURN - SINON ESC.
DESIGNATION DU VECTEUR-COLONNE? P

COLONNE N° 6

FREQUENCE N° 1 =? 2526
FREQUENCE N° 2 =? 2263
FREQUENCE N° 3 =? 2421
FREQUENCE N° 4 =? 2052
FREQUENCE N° 5 =? 1473
FREQUENCE N° 6 =? 1842

CORRECT ? SI OUI RETURN - SINON ESC.

DESIGNATION DU VECTEUR-LIGNE N° 1
? D1

DESIGNATION DU VECTEUR-LIGNE N° 2
? D2

DESIGNATION DU VECTEUR-LIGNE N° 3
? D3

DESIGNATION DU VECTEUR-LIGNE N° 4
? D4

DESIGNATION DU VECTEUR-LIGNE N° 5
? D5

DESIGNATION DU VECTEUR-LIGNE N° 6
? D6

A PRIORI,COMBIEN D'AXES FACTORIELS VOUS SERONT-ILS UTILES(MAX:N-1)? 5

POPULATION TOTALE :	79908	
VALEUR MAXI DU LIEN :	5	
VALEUR REELLE DU LIEN :	.018	
% DU LIEN DU A L'AXE N° 1 :	55.1 %	VALEUR PROPRE N° 1 : 0.0101
% DU LIEN DU A L'AXE N° 2 :	40.9 %	VALEUR PROPRE N° 2 : 0.0075
% DU LIEN DU A L'AXE N° 3 :	3.2 %	VALEUR PROPRE N° 3 : 0.0006
% DU LIEN DU A L'AXE N° 4 :	.6 %	VALEUR PROPRE N° 4 : 0.0001
% DU LIEN DU A L'AXE N° 5 :	.2 %	VALEUR PROPRE N° 5 : 0.0000
CHI DEUX (LIEN¤POPULATION) :	1470.2	
VALEUR BETA :	289	

IMPRESSION DES COORDONNEES PAR BARRE D'ESPACEMENT
QUELS SONT LES DEUX AXES FACTORIELS DESIRES (EX.:1,2)? 1,2

COORD. DES CARRES			COORD. DES CROIX			
X	Y	POIDS	X	Y	POIDS	
-8	-16	15808	196	95	11401	T
79	-147	13065	-5	-102	13555	M
-73	-53	14770	-141	134	14098	C
-73	37	12968	-73	-56	13027	I
-103	104	11704	15	-4	15250	E
198	104	11593	39	-67	12577	P

INPRESSION DES COSINUS CARRES PAR BARRE D'ESPACEMENT

MESURE DE LA QUALITE DE LA REPRESENTATION DANS LE PLAN FACTORIEL

COORD. DES CARRES		COSINUS CARRES DES VECTEURS-LIGNES AVEC:		
AXE 1	AXE 2	L'AXE 1	L'AXE 2	LE PLAN FACTORIEL
X	Y	COS(1)	COS(2)	SOMME
-8	-16	0.097	0.361	0.458
79	-147	0.223	0.754	0.978
-73	-53	0.606	0.313	0.919
-73	37	0.699	0.186	0.886
-103	104	0.451	0.471	0.923
198	104	0.777	0.216	0.993

PROGRESSION PAR BARRE D'ESPACEMENT

COORD. DES CROIX		COSINUS CARRES DES VECTEURS-COLONNES AVEC:		
AXE 1	AXE 2	L'AXE 1	L'AXE 2	LE PLAN FACTORIEL
X	Y	DCOS(1)	DCOS(2)	SOMME
196	95	0.793	0.186	0.978
-5	-102	0.002	0.966	0.968
-141	134	0.526	0.488	1.014
-73	-56	0.571	0.328	0.899
15	-4	0.174	0.010	0.184
39	-67	0.195	0.556	0.751

IMPRESSION DES CONTRIBUTIONS PAR BARRE D'ESPACEMENT

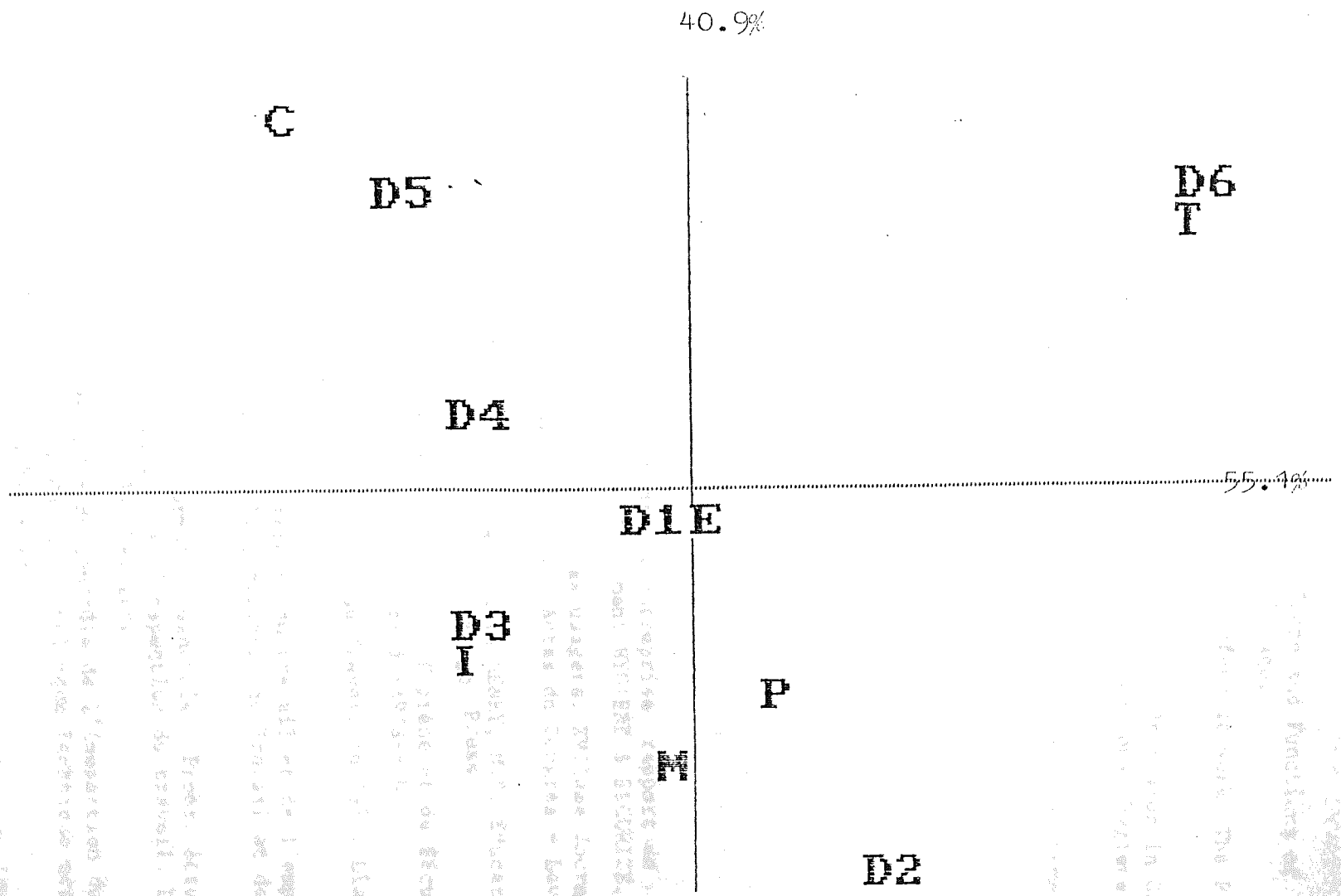
CONTRIBUTIONS DES VECTEURS-LIGNES ET COLONNES AUX INERTIES DES AXES

COORD. DES CARRES		CONTRIBUTIONS (EN %) DES VECTEURS-LIGNES A:		
AXE 1	AXE 2	L'AXE 1	L'AXE 2	
X	Y	INL(1)	INL(2)	
-8	-16	0.12	0.63	
79	-147	10.25 x	46.61 x	D 2
-73	-53	9.56	6.65	
-73	37	8.50	3.05	
-103	104	15.22 x	21.40 x	D 5
198	104	56.34 x	21.05 x	D 6

PROGRESSION PAR BARRE D'ESPACEMENT

COORD. DES CROIX		CONTRIBUTIONS (EN %) DES VECTEURS-COLONNES A:		
AXE 1	AXE 2	L'AXE 1	L'AXE 2	
X	Y	INC(1)	INC(2)	
196	95	54.47 X	17.19 X	T
-5	-102	0.03	23.21 X	M
-141	134	34.11 X	42.60 X	C
-73	-56	8.53	6.60	
15	-4	0.48	0.04	
39	-67	2.39	9.18	

BARRE D'ESPACEMENT POUR LE GRAPHIQUE
POUR CHOISIR DEUX NOUVEAUX AXES, APPUYEZ SUR LA BARRE D'ESPACEMENT
POUR ARRETER LE PROGRAMME, APPUYEZ SUR ESC
D1
D2
D3
D4
D5
D6
I
M
C
I
E
P


40.9%
C
D5
D6
T
D4
55.1%
D1
E
D3
I
P
M
D2

R E F E R E N C E S

ACKOFF, R. 1971. Toward a System of Systems Concepts. Manag. Science 17 pp. 661-71

AMERICAN SOCIETY OF SAFETY ENGINEERS, 1966. Scope and Functions of the Professional Safety Position, Chicago.

ATHERLEY, GRC. 1975. Strategies in Health and Safety at Work. The Production Engineer. 54 50-5.

ATHERLEY, GRC & HALE, A.R. 1975. Prerequisites for a Profesion in Occupational Safety & Hygiene. Annals of Occupational Hygiene v 18 321-334.

ATHERLEY, GRC. BOOTH, RT. and KELLY, M.J. 1975. "Workers' involvement in occupational Health and Safety in Britain". International Labour Review,III 469-482.

ATHERLEY, GRC. 1978. Occupational Health and Safety Concepts.Applied Science Publishers. London.

AYMARD. 1976. Projet de rapport du groupe AYMARD, Document interne du Ministère du Travail.

AYOUB, M.A. 1975. Occupational Safety and Health. Industrial Engineering. April.

AYOUB, M.A. 1981. Simulation Modeling and Analysis in Safety. Decision Models. Jour. of OCCUP. Acc. Elsevier Sc. Pub. Comp. Amsterdam. March.

BARBAILLER, B. 1976. La prevention dans l'entreprise rapport de stage I.U.T. de Bordeaux. Département HYGIENE & SECURITE.

BEAULIEU, L. 1982. Le tiers-temps vu par les usagers. XVIIème Journées Nationales de Médecine du Travail. Actes du Congrès - Lavoisier.

BECKER, H.S. 1962. The Nature of a Profession in HENRY, N.B. Education for the Profession, University of Chicago Press

BETTIGNIES, L.A. 1976. L'Institution du Comité d'Hygiène et de Sécurité" rapport offset CREST - Université PARIS-SUD.

BODIGUEL, J.L. 1979. Le métier d'Inspecteur du Travail en 1979. Liaisons Sociales. 9. Novembre.

BODIGUEL, J.L. 1979. Les services extérieurs du travail et de l'emploi. Document remis à Robert Boulin, Ministre du Travail et de la participation.

BODIGUEL, J.L. 1981. Doctrine et Information Générale : Probs. Actuels et Perspectives d'évolution de l'inspection du travail. La Revue Administrative n° 199, Février.

BOIS, P. 1982. Objectifs et Méthodes du Contrôle de l'Inspection du Travail dans l'Industrie Chimique. Colloque Technique organisé par L'AIIT, Oct. 678. Paris.

BOISSELIER, J. and BOUE, J. 1977. Pratique de la Sécurité dans l'Entreprise. Edit. E.O. Paris.

BOOTH, R.T. 1976. Machinery guarding (Technical file 36) Engineering. Dec. 1- 8.

BOOTH, R.T. 1979. Safety : too important matter to be left to the Engineers ? Inaugural Lecture Aston University.

BOOTH, R.T & GLENDON, A.I. 1982. Worker participation in occupational Health and Safety in Britain" International Labour Review. 121.

BOULIN, R. 1979. Reglementation Relative à la formation à la sécurité : Guide pratique. Ministre du Travail.

BRESSION, J.R. 1982. Les médecins du travail et l'exercice du tiers-temps. Réalité et efficacité. XVIIème Journées Nationales de Médecine du Travail - Lavoisier.

CAILLARD, J. 1982. Enquête sur les réalités du tiers-temps vécues par les Médecins du Travail de Normandie. XVIIème Journées Nationales de médecine du travail. Actes du Congrés. Tec. Doc. Lavoisier.

CANTINEAU, A. 1982. Le tiers-temps du médecin du travail dans la région Bretagne. XVIIème Journées Nationales du Médecine du Travail. Actes du Congrés. Lavoisier.

CARTWRIGHT, T.J. & GABBOUR, I.I. 1975. Graph Theory and Managing Urban Change. Socio Economic Planning Sciences, 9 197-204.

C.E.A. 1985. Perception des intervenants, Laboratoires de Stat. et Et. Soc. Econ. (in press).

CHAABANE, S. 1984. La Médecine du Travail : Obstacle au Développement de la Profession Hygiène et Sécurité ? Colloque Hygiène & Sécurité - Université de Batna. May. 1984.

CHAILLE, G. 1980. La misère de l'inspection du travail. Echange Travail.

CHANUT, J.C. 1974. "A propos d'une méthode d'enregistrement des accidents du Travail" - Sécurité & Médecine du Travail n° 3 - Février-Mars.

CHETCUTTI, C. 1976. Reflexions sur l'inspection du travail, Droit Social n° 2 Février.

CHETCUTTI, C. 1977. L'inspection du travail et la prévention des accidents du travail. Droit Social n° 3. Mars.

COGAN. 1953. Towords the definition of a profession, Haward Education. Review. Winter.

COHEN, A. SMITH, M.J. & COHEN, H.H. 1975. Safety program practices in high versus low accident rate compagnies. An Interim Report Hew publication number (NIOSH).

COLLINS J.H & WHITTAKER, R. 1979. An example of a systems Approach to the study of an Organisation-Its structure and Methods of Working.

COURTIEU, G. 1975. L'entreprise société féodale ; Ed. Seuil Paris.

DAVID, B. 1982. Le tiers-temps groupé-réinsertion professionnelle des handicapés. XVIIème journées Nationales de Médecine du Trvail Actes du Congrès. Lavoisier.

DAVIS, K. and MOORE, W.E. 1945. Some Principles of Stratification. in BERNARD, F. and HAMEL, P. Vers une déprofessionnalisation de la Profession Comptable. Socio. du Travail n° 2/82.

DELPINE, P. 1982. Rôle du Médecin du Travail dans la démarche ergonomique. XVIIème Journées Nationales de Médecine du Travail. Actes du Congrès. Lavoisier.

DE NEVE, M. 1976. La participation des travailleurs à la sécurité. Etude pilote n° 535/RI INRS. PARIS.

DEZANDRE, C & CORBERAND, A. 1981. Les attitudes des chefs d'entreprise face à la formation- quelques données, published by Entreprise et Progrès. PARIS.

DHOQUOIS, R. 1976. L'inspection du travail : Recherche sur une institution. Thèse de Doctorat. Paris I.

DIPIERTO, A. 1976. An Analysis of the OSHA Inspection Program in Manufacturing Industries 1972-73. US. Dept. of Labour.

DORVAL, P. 1977. Training & Further training of Engineers and Technicians Responsible for Safety. European Economic Community Report 4532/77 EN.

DOS SANTOS, J. and ULIANA, R. 1982. Technical and Practical Elements to be considered in Safety Training at University and College of Technology Level. Report of the seminar of 6,7,8 may E.E.C Document n°6766/82.

DUPEYROUX, J.J. 1969. Sécurité Sociale, précis DALLOZ.

DUPLAT, J. 1977. La responsabilité pénale du chef d'entreprise. La loi du 6/12/76 a-t-elle modifié sa mise en oeuvre. Cahiers des Comités de prévention 2/77.

EMERY, F.E. & TRIST, E. 1969. Socio-Technical Systems in EMERY. 1969. Systems thinking. Harmondsworth : Penguin 6.

ENGLISH, W.P. 1979. How effective safety Committees are ? professionnal Safety 25-27.

FAVERGE, J.M. 1967. Psychologie des Accidents du Travail. Presses Universitaires de France. Paris.

FLEXNER, A. 1915. is social work a profession ? School and Society. V.I. June in Cogan, op. cit.

FOUCHER, C. 1978. Histoire de l'inspection du travail en France : Naissance de l'institution. Ministere du travail.

FOURNIER, J. and QUESTIAUX, N. 1976. Traité du Social. Situation Luttes Politiques, Institutions. Ed. Dalloz PARIS.

FOURNIER, P. 1982. Rapport sur l'hygiène, la sécurité et la médecine du travail dans les organismes de recherche scientifique publié par l'Inspection Générale des Affaires Sociales.

GAMOT, M. 1982. une expérience du tiers-temps dans une usine textile. XVIIème Journées Nationales de Médecine du Travail. Actes du Congrès. Lavoisier.

GARNOT, E. 1981. L'efficacité Socio-économique de l'Inspection du Travail. Thèse de 3ème Cycle Université Paris Dauphine.

GAUDEMET, U. 1978. Les Comités d'Hygiène et de Sécurité dans l'Entreprise. Droit Social.

GRAYHAM, D. 1981. Safety advisers under the microscope. Safety Surveyor, March P.8.

GRAYHAM, D. Work in progress. The role of safety practitioners in U.K. Study Registered for Ph. D. University of Aston in Birmingham.

GRIMALDI, J.V. and SIMONDS, R.H. 1975. Safety Management, RICHARD. IRWIN Inc. ONTARIO.

GROSE, V.L. 1980. Converting Health Hazard Control From Moralism to Management. Professional Safety. March.

GUYONNET, J.F. 1978. L'arbre des Causes pour l'étude des Risques dans un Système Complexe. Face au Risque n° 148.

GUYONNET , J.F. 1984. Les méthodes d'analyse de la sécurité des Systèmes. R.G.S. n° 30. January.

HALE, A.R. & PERUSSE, M. 1978. Perception of Danger : A prerequisite to safe decisions.

HALE, A.R. 1983. Self-regulation and the role of the inspector of Factories, Paper to "Regulation in Britain Conf." Trinity College Oxford Sept.

HALE, A.R. PINEY, M. & ALESBURY, R. 1984. Whither Occupational Hygiene ? a Review of Professional Development and Future Options. Paper given to Annual Conference of the British Occupational Hygiene Society. York.

HEALTH & SAFETY at work. etc. Act 1974. HMSO London.

HEATH, E.D. 1982. Worker Training and Education in Occupational Safety and Health : A Report on Practice in six Western Industrialised Nations. Jour. of. Saf. Res. V 13.

HENRY, N.B. 1962. The nature of a profession Ed. Education for the profession. University of Chicago.

HODEBOURG, J. 1982. Le point de vue de la C.G.T. sur le tiers-temps. XVIIème Journées Nationales de Médecine du Travail. Actes du Congrès. Lavoisier.

ILLICH, Y. 1975. Némésis Médicale. Seuil. Paris.

I.L.O. 1980. Rapport Tripartite d'évaluation de l'efficacité de l'Inspection du Travail en France. Genève. B.I.T.

JAVILLIER, M. 1975. Ambivalence, efficacite et adequation du droit pénal du travail. Droit Social n° 4. Avril.

JEANTELET, D. 1981. L'Inspecteur du Travail et la Connaissance des Produits dangereux utilisés dans l'entreprise. Echange Travail, Publication du Ministère du Travail.

JOHNSON, T.J. 1972. Profession and power. Macmillan. London.

JUMBU MERLIN, R. 1979. La Sécurité Sociale. Ed. Armand Colin.

KEITA, I. 1981. Gestion des Conditions de Travail et Méthode d'évaluation de l'ANACT. Mémoire de D.E.A. Paris IX.

KLETZ, T.A. 1976. The Application of Hazard Analysis to Risks to the Public at Large. Environment and Human Activities. Amesterdam. July. 1.

LABRIFFE, H. 1982. Education sanitaire en entreprise. XVIIème Journées Nationales de Médecine du Travail. Lavoisier.

LABYLE-COUCHAT. 1977. La faute inexcusable depuis la loi du 6/12/76. Cahiers des Comités de prévention 3/77.

LADOUSSE, C. 1979. Le Rôle du Médecin du Travail de service autonome dans l'entreprise. Thèse de Doctorat. Université de Bordeaux II.

LAGADEC, P. 1981. Le risque technologique Majeur. Pergamon.

LAMAISON, L. 1985. La notion de danger grave et imminent. Thèse en cours. Faculté de Droit. Bordeaux I.

LEPLAT, J. & CUNY, X. 1979. Les Accidents du Travail. Presses Universitaires de France. Paris.

LETOUBON, M. 1979. Politique et stratégie des entreprises du bâtiment et des travaux publics en matière d'accidents du travail. Thèse pour le doctorat d'Université. Université Jean Moulin, LYON.

MAURICE, M. 1979. Propos sur la sociologie des professions Sociologie du travail. V.4.

Mc CORMICK, N.J. 1981. Reliability and Risk Analysis. Academy Press. New York. Chapter 11.

MERIGOT, J.G. & LABOURDETTE, A. 1980. Elements de Gestion Stratégiques des Entreprises. Ed. CUJAS. PARIS.

MILLERSON, F. 1964. The Qualifying Association. Routledge & Kegan Paul, London. in ATHERLEY and HALE, 1975.

MONSCHE, M. 1982. Contenu et réalité du tiers-temps en médecine du Travail. XVIIème Journées Nationales de Médecine du Travail. Actes du Congrès. Lavoisier.

NUTTE, A. 1976. Pour un développement de la prévention des accidents du travail. Cahiers des Comités de prévention. 6/1976.

OI, W. 1975. On Evaluating the Effectiveness of the OSHA. inspection Program. U.S. Dept. of Labour.

OPPENHEIM, A.N. 1976. Questionnaire Design and attitude Measurement Heinmann LONDON.

PACHET, A. 1981. La législation de la sécurité du travail. Face au Risque n° 171. Mars.

PARRANT. 1983. Le fonctionnement des services médicaux du travail après la loi du 23/12/82 sur les CHSCT. 2ème Colloque Aquitain Hygiène et Sécurité 7, 8, 9 juin 1983.

PETERSEN, D. 1978. Techniques of Safety Management. Mc graw Hill Kokagusha, Ltd.

PHILBERT, M. 1982. Le médecin du travail, le tiers-temps et l'ingénieur de sécurité. XVIIème Journées Nationales de Médecine du Travail. Actes du Congrès. Lavoisier.

POLLET, B. 1982. Une expérience du tiers-temps groupé dans les industries alimentaires du Nord de la France. XVIIème Journées Nationales de médecine du travail. Actes du Congrès. Lavoisier.

POPE, C. and CRESSWELL, T.J. 1965. A New Approach to Safety Management Programs A.S.S.E. Journal, Aug.

POUBLAN, M. 1980. Comment se représente-t-on le médecin du travail. Thèse pour le doctorat en médecine Université de Bordeaux II.

REVUE DE LA SECURITE. 1982. Où en est la fonction sécurité ? Février.

RIGHINI, C. 1976. Perspectives de la médecine du travail. Arch. Mal. prof. 1977, 38.

ROTHAN, A. 1982. L'Inspection Médicale du Travail et de la Main-d'Oeuvre. Echange Travail. Pub. Minist. du Trav.

ROUAST, V & GIVORD. 1935. Traité du droit des accidents du travail et des Maladies Professionnelles.

SALENGROS, R. 1967. Psychologie des Accidents du Travail. Presses Universitaires de France. Paris.

SEILLAN, H. 1976. Fonctionnement du Comité d'Hygiène et de Sécurité. Droit Social. DALLOZ. PARIS.

SEILLAN, H. 1981. (a) Réflexions sur la notion juridique d'Hygiène et Sécurité. Revue AFTIM. MARS-AVRIL.

SEILLAN, H. 1981. (b) L'Obligation de Sécurité du Chef d'Entreprise. DALLOZ.

SEILLAN, H. 1982. Les CHSCT. Loi du 23 Décembre 1982. Cahiers des Comités, Janvier.

SEILLAN, H. 1983. Propos critiques sur les creux et les bosses du décret du 23/12/82 relatif au CHSCT. Actualité législative. DALLOZ.
Projet de Loi relatif aux CHSCT, Revue pratique de droit social n° 442.443. Mars 82.

SEILLAN, H. 1984. La formation des représentants du personnel au CHSCT, Moniteur. Novembre.

SMITH, R.S. 1975. The Estimated Impact on Injuries of OSHA'S Target Industry Program. U.S. Dept. of Labour. March.

SMITH, R.S. 1979. The impact of OSHA Inspections on Manifacturing Injury Rates. The Jour. of Hum. Res. XIV.

SNITMO. 1970. Rapport du Syndicat National des Inspecteurs du Travail et de la Main d'Oeuvre.

SUDREAU, P. 1975. Rapport du Comité d'Etudes pour la réforme de l'entreprise. Documentation Française.

SURREY, J. 1969. Industrial Accident Research : A human eng. appraisal Toronto : Labour Safety Council of Ontario. in Hale & PERUSSE.1978.

SWAIN, A. 1983. Handbook of Human Reliability Analysis with emphasis on Nuclear Plant Application. NUREG/CR/1278.

SZEKELY, J. 1979. La sécurité dans une usine de production. Etude Monographique n° 464/RE INRS PARIS.

TANGUY, P. & GUYONNET, J.F. 1978. La prévision rationnelle des Grands Risques. Le progrés Technique. Décembre.

TARGOWLA, O. 1976. Les médecins aux mains sales. Edition Belfond.

TARRANTS, EW. 1970. A definition of the safety measurement problem. Journal of Safety Research V2 N3.

TEYSSIE, B. 1983. Etudes pratiques. Hygiène, Sécurité et Conditions de Travail, in Etudes et Commentaires. N° 1405.

TOULISSE, J.M. 1982. Revendication d'une Association Régionale (CFDT). XVIIème Journées Nationales de Médecins du Travail. Actes du Congrès. Lavoisier.

TOURNERIE, J.A. 1971. Le Ministère du Travail, Ed. Cujas PARIS

VERGER, C. 1982. Quelle formation pour le tiers-temps ? XVIIème Journées Nationales de Médecine du Travail. Lavoisier.

VERNON, R.J. 1983. Professional Development. Certification. Recognition in occupational Safety. Annals of the American Conference of Govermental Industrial Hygienists v5 pp 79-85.

VETTERHOEFFEN, M. 1977. Les Comités d'Hygiène et Sécurité ont 30 ans". in Travail et Sécurité. pp 404. 410.

WILLENSKY, H.L. 1964. The professionalisation of everyone. Am. J. Social. 70.

SINGLETON W.T. (1983) Occupational Safety and health : a three-country Comparison. International Labour Review.Vol 122 n° 2. March-April.

LEGISLATION

- Code du travail - DALLOZ. 1982

- PLUYETT. J. (1982). Hygiène - Sécurité & Conditions de Travail - Lois & Textes Reglementaires - Technique et Documentation - LAVOISIER - PARIS.

- Projet de loi relatif au CHSCT, Revue pratique de Droit Social n° 442-443. Mars 1982.

QUANTITATIVE DATA

- Rapports annuels d'activité de l'Inspection du Travail publié par le Ministère du Travail, Direction des statistiques (1972-1983)

- Rapports annuels d'activité de la Caisse Nationale d'Assurances Maladies publiés dans Travail et Sécurité (INRS 1972-1982).

- Rapports Annuels d'activité de la Caisse Régionale d'Assurances Maladies d'Aquitaine - Documents internes (1972-1982)

MATHEMATICS

BERTIER P., BOUROCHE J.M. (1975), Analyse de Données Multidimensionnelles, Presses Universitaires de France, Paris.

CAZES P., LECOUTRE J.P. (1977), Etude de quelques problèmes de Codage en Analyse des Correspondances, Cahiers du Bureau Universitaire de Recherche Opérationnelle, Université Pierre et Marie Curie, PARIS N. 27.

LABART L., MORINEAU A., TABARD N. (1977). Techniques de la Description Statistique, Méthodes et Logiciels pour l'Analyse des Grands Tableaux, DUNOD, PARIS.

MORIZET-MAHOUDEAUX P (1981). Aide à la décision dans le choix des systèmes technologiques pour l'hopital. Thèse du Docteur Ingénieur Université de Technologie de Compiègne.

YRIBARREN M. Les Sondages au Service de l'Audit, Ed. Hommes et Techniques. Paris. 1975.