Commission of the European Communities

Proceedings
of the European
Motor Vehicles Symposium

and the
Seminar
on Accident Statistics

Volume II

Brussels, 9 – 12 December 1975

For about 10 years, motor vehicles design has been increasingly influenced by a number of external factors such as safety or environnmental requirements, saturation of the road network, urban congestion, the long-term depletion of resources, etc. Recently, the problems besetting crude oil supplies and rocketing prices have highlighted the need to pursue energy in the most rational way possible. These factors directly influence demand, and the motor industry must, therefore, adapt its products accordingly. This requires long-term research and very heavy investment, but the path can be eased considerably if industry is aware of future requirements sufficiently in advance. The guidelines for regulations applying to motor vehicles from 1980 on must, therefore, be laid down now in order to enable the motor industry to plan its future production.

Community action to date has brought about the EEC type-approval procedure for motor vehicles, together with several special directives forming part of the programme on the removal of technical barriers to trade. Additions, however, will have to be made which take account of technical progress, current restrictions and restrictions which society will demand in future.

The Community must also be in possession of objective scientific data which will form the basis of future regulations and of valid Community-wide statistics. The aims of the symposium were:

— to coordinate the activities of all interested parties with a view to improving vehicle safety and the protection of the environment, while taking account of the need to conserve energy and raw materials;

— to lay the foundations of a programme for the drawing up of new regulations which take account of the economic, financial and social requirements of both users and manufacturers and incorporate a cost-benefit ratio acceptable to society;

— to pin-point the priorities governing the measures to be taken and to avoid any risk of incompatibility between the solutions;

— to stress both the need for avoiding unilateral national measures and the desirability of laying down procedures enabling the geographical scope of Community regulations to be extended.

Manuscript finished in June 1976.

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FOREWORD

This work has been produced in two volumes.
The first is devoted to the opening session along with the first five sessions of the European Motor-vehicle symposium.

The second volume covers the sixth session of the symposium and the seminar on traffic accident statistics as well as the final sessions of the Symposium and the seminar; this second volume also covers the list of participants.

The reader's attention is drawn to the fact that oral interventions were recorded in their original version and their spontaneous character has been preserved.

SUMMARY

SYMPOSIUM AND SEMINAR PROGRAMME

TUESDAY 9 DECEMBER 1975

Morning

OPENING SESSION

Opening address by Mr F.O. GUNDELACH, Member of the Commission of the European Communities

SESSION 1

Chairman : Mr F. BRAUN, Director-General responsible for the Internal Market

Vice-Chairman : Mr C. GARRIC, Head of the Division "Inland transport and new means of transport"

Presentation of paper "Structural strength and compatibility of vehicles in the event of impact" (potential hazard to other means of transport and to pedestrians) by Mr H. TAYLOR of the Transport and Road Research Laboratory

Discussion by the panel

General discussion

Summing-up

Afternoon

SESSION 2

Chairman : Mr S. JOHNSON, Head of the Division "Prevention of pollution and nuisances"

Vice-Chairman : Mr D. VERDIANI, Head of the Division "Removal of technical barriers of an industrial nature"

Presentation of the paper "Noise pollution" (requirements, ways of meeting them and methods of measurement) by Mr J.P. THIRY of the UTAC Laboratory

Discussion by the panel

General discussion

Summing-up

WEDNESDAY 10 DECEMBER 1975

Morning

SESSION 3

Chairman : Mr P. SCHLOESSER, Director responsible for the Movement of Goods

Vice-Chairman : Mr D. VERDIANI, Head of the Division "Removal of technical barriers of an industrial nature"

Presentation of the paper "Protection of vehicle occupants" (biomechanical aspects, performance of various restraint systems) by Mr G.M. MACKAY of the University of Birmingham

Discussion by the panel

General discussion

Summing-up

Afternoon

SESSION 4

Chairman : Mr J. DOUSSET, Director responsible for Financial Infrastructure and Technical Aspects

Vice-Chairman : Mr D. VERDIANI, Head of the Division "Removal of technical barriers of an industrial nature"

Presentation of the paper "Accident prevention by suitable vehicle design" (active safety : braking, road holding, tyres, lighting systems, field of vision, etc) by Mr M. MITSCHKE of the Technische Universität Braunschweig

Discussion by the panel

General discussion

Summing-up

THURSDAY 11 DECEMBER 1975

Morning

SESSION 5

Chairman : Mr D. VERDIANI, Head of the Division "Removal of technical barriers of an industrial nature"

Presentation of the paper "Air pollution" (future requirements, potential technical trends in vehicle design) by Mr E. SIBENALER of the Ecole Royale Militaire Laboratory

Discussion by the panel

General discussion

Summing-up

Afternoon

SESSION 6

Chairman : Mr G. BRONDEL, Director responsible for hydrocarbons

Vice-Chairman : Mr D. VERDIANI, Head of the Division "Removal of technical barriers of an industrial nature"

Presentation of the paper "Rational use of energy and raw materials" from Mr F. SEZZI of the Laboratorio Ricerche e Sviluppo - SNAM PROGETTI by Mr ZANONI of the Ufficio Sviluppo Carburanti, Combustibili e Bitumi - AGIP

Discussion by the panel

General discussion

Summing-up

THURSDAY 11 DECEMBER 1975

SEMINAR

"ROAD ACCIDENT STATISTICS"

Opening address from Mr C. SCARASCIA MUGNOZZA, Vice-President of the Commission of the European Communities by Mrs F. DESHORMES, Member of the Cabinet.

General introduction by the Chairman, Mr J. MAYER, Director-General of the Statistical Office.

Introduction of the paper by Mr E. ANDREASEN, who is responsible for road accident statistics in "Danmarks Statistik".

Discussion by the panel on the needs of the main sectors concerned (health services, police, insurance companies, road safety organizations...) regarding internationally coordinated statistics.

General discussion.

Summing-up.

FRIDAY 12 DECEMBER 1975

Morning

FINAL SESSION

Presentation of the conclusions of the Symposium sessions and of the Seminar by the rapporteurs.

Questions.

Summary of conclusions and definitions of priorities by Mr F. BRAUN, Director-General responsible for the Internal Market.

Statement by Mr P. DREYFUS in the name of the European manufacturers.

Statement by Mr ROSSI in the name of Mr MARTINELLI President of the Council of Ministers of the European Communities.

Closing address by Mr F.O. GUNDELACH, Member of the Commission of the European Communities.

SIXTH SESSION

RATIONAL USE OF ENERGY AND RAW MATERIAL

The report on the national use of energy and primary materials' was initiated by F. SEZZI , an engineer oat the Snamprogetti research laboratory for petroleum products.

M. SEZZI, who is absent due to illness has been replaced by M. ZANONI who presented the report and participated in the debates as well as with the final conclusions.

On behalf of the participants and organisers of the symposium, a telegram has been sent to M. SEZZI inviting him a quick recovery.

RATIONAL USE OF ENERGY AND RAW MATERIAL

RAPPORTEUR

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Ufficio Sviluppo Carburanti
Combustibili e Bitumi AGIP

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REPORT of Mr F. SEZZI
presented by Mr E. ZANONI

1. FOREWORD

The structure of this Symposium is such that three of its Sessions are allocated to "Safety", one to Noise, one to Air Pollution and one to Energy and Raw Materials. Such a structure would tend to suggest that in the case of a subject as vast and complex as the last named, which certainly cannot be treated exhaustively in a few pages or in a couple of hours of discussion, the aim is primarily to survey the situation, decide how far it is acceptable, and identify the general strategical outlines of a Community policy, rather than to elicit an analytical set of suggestions designed to give effect to an assortment of isolated measures. On that assumption this report has been planned to give a picture of the present situation of the motor vehicle and of the energy resources bound up with it, confining a somewhat deeper treatment to a few of the more important - or more hotly debated - points. This has been done for the following reasons :

a) A thorough survey of all the problems and of their connections with each other or with external factors is impossible for reasons of space and time.

b) A simple list of the problems, followed by summary proposals or suggestions, would be pointless (and indeed self-defeating) since it would lack the arguments necessary for justifying the proposals themselves.

c) The report does not claim to arrive at firm conclusions and hence at specific proposals for every aspect of the problem; in many cases it can recommend only one course - that of demanding and encouraging the necessary theoretical and experimental research. Instead, it points out the steps that could be taken in the short term without the risk of compromising a later organic measure.

To conclude this brief Foreword we propose the following definition of a Community strategic policy :

To reduce, in the context of the overall energy problem, such Community imports of oil, materials and technology as arise from the manufacture and use of motor vehicles. To achieve such reductions within the concept of an open-market economy, without generating pollution through poor quality.

This saving of energy "input" must be effected on the "output" of useful energy necessary for economic and social development. It does not necessarily mean using less energy; it is a matter of making better use of the energy available and cutting down wastage in the generation and consumption of energy.

2. REVIEW OF CURRENT REGULATIONS

2.1. European Community

In contrast to the action taken on the other motor vehicle problems dealt with at this Symposium - which can be grouped under the headings of Safety and Pollution - the Community countries have not adopted specific legislative measures to rationalize the use of energy. The drastic emergency measures of Autumn 1973 were in fact repealed as soon as it was apparent that there was no longer an actual danger of restriction of the main energy source, namely oil. What have remained are the massive increases in the burden of taxation on motor fuels and, in some countries, limits on speed.

Recently, however, some governments have altered the annual motor-vehicle road taxation system in such a way as to use it indirectly to control consumption. In France and Italy, for example, the tax bears upon the cylinder capacity, rising in a steeper than linear curve. In Belgium and in the Netherlands, on the other hand, the weight of the motor vehicle determines the tax. The disadvantages of the first solution are that it gives an impetus to higher specific power outputs at the possible cost of efficiency; the second solution has the disadvantage that it penalizes large families who need roomy, therefore heavy, motor vehicles.

In France, moreover, a law passed in March 1975 lays down that the consumption shall be measured at two speeds on the open road and in the European (ECE) driving cycle. These consumption figures must then be entered in the motor vehicle log-book.

2.2. Other countries

Out of the other countries, the United States of America will be considered in particular here. The status of transport by motor vehicle in that country is very different from that in the Community, and it was the first country to highlight the problems posed by the motor vehicle from both the pollution and energy standpoints and it therefore can be regarded as a criterion of great importance to the countries of the Community. Particularly important as regards energy conservation in the motor vehicle field is the "Energy Conservation and Oil Policy Act of 1975".

The salient features of this Act are :

a) financing of a campaign to mould public opinion;

b) actions on motor fuel prices;

c) stricter speed limits;

d) limitations on motor vehicle consumptions.

The aim of the last item is to reduce the fuel consumption of new motor vehicles in 1980 by 30% and of new motor vehicles in 1985 by 50% compared with 1974. Such reductions must be achieved by each manufacturer in accordance with Article 502 of this Act, which lays down that :
"... the average fuel economy for passenger automobiles manufactured by any manufacturer in any model year after model year 1977 shall not be less than the number of miles per gallon determined for such model year under the following table :

Model year	Average fuel economy (in miles per gallon)
1978	18.5
1979	19.5
1980	20.5
1981/1984	to be determined not later than July 1, 1977
1985	28.0

It should be remarked that this section of the Act, although it is the most specific and rational, can only have long-term effects; whereas the other sections examined are less specific and selective, but have the advantage of having an immediate fuel-saving effect.

2.3. Community action

The absence of specific legislation in the majority of member countries offers the Commission of the European Communities the opportunity meanwhile of outlining some norms preliminary to an entire Directive on the subject.
The basic principle of this outline of norms should be that of standardizing the various bodies of law into a homogeneous policy as regards :

- motor fuel prices;

- speed limits;

- road taxes;
- obligation of showing the consumption rates in the motor vehicle log-book on the lines of the French law.

The suggestion of assembling these items into an outline preliminary to an entire Directive stems partly from the consideration that there already are laws on these matters in the member countries and that the backgrounds from which they derive seem fairly homogeneous, but principally from the difficulty of tackling in its entirety the problem of fuel economy in motor vehicles, which is so complex that it allows no hope of laying down sound lines for an organic Directive in the short term.

3. THE MOTOR VEHICLE AND ENERGY - PRESENT STATUS AND PROSPECTS

There has been a huge increase in road transport, and the motor car in particular over the last fifteen years. Road transport has used and still uses the liquid derivatives of mineral oil almost exclusively, and there is no certainty that this situation can be radically altered in the coming decade.

It will therefore be useful at this point to analyse the present position and make a few conjectures regarding developments both in the motor vehicle and in the consumption and production of motor fuels in the immediate future.

3.1. The motor vehicle itself

This section gives in broad outline a general picture of the spread of the motor vehicle in the Community, comparing the position in Europe with that in the United States where motorization and its attendant problems have assumed even more conspicuous proportions. Table 1 shows the number of motor vehicles in use in the Community and the USA in 1974, broken down into private and commercial motor vehicles. Commercial vehicles amount to 10% of all motor vehicles at present in use in the Community, and 20% in the USA. Since the average annual consumption of a commercial motor vehicle is usually well above that of a private vehicle, the effect of the commercial vehicles on the overall consumption of fuel is, expressed as a percentage, very much greater. This problem will not, however, be tackled in the present Paper, save for some considerations on the spread of the diesel-engined car, which will be dealt with specifically in a separate section.

Figures 1 and 2 /1/ show the changes in the number of vehicles in use and the registrations of private motor vehicles in the European Community and the USA over the years 1967-74. An idea of the variation in the (short-term) forecasts on the development of motorization before and since the crisis, i.e., over one single year of difference, can be gathered by extrapolating the graphs for 1967-73 and 1973-75 (first half-year). In the case of Europe, the number of private motor vehicles in use in 1980 would be about 10 million units fewer than the earlier forecasts indicated.

Now let us look at the present position as regards the characteristics of the motor vehicle which influence its consumption.

The main characteristics are :

Table 1 - Motor vehicles in use in 1974

		European Community	U S A
Private vehicles	No.	68 422 167	105 287 000
	%	(90.0)	(80.5)
Commercial vehicles	No.	7 627 490	25 464 000
	%	(10.0)	(19.5)
Total	No.	76 049 657	130 751 000

FIG. 1 - PRIVATE MOTOR VEHICLES IN USE

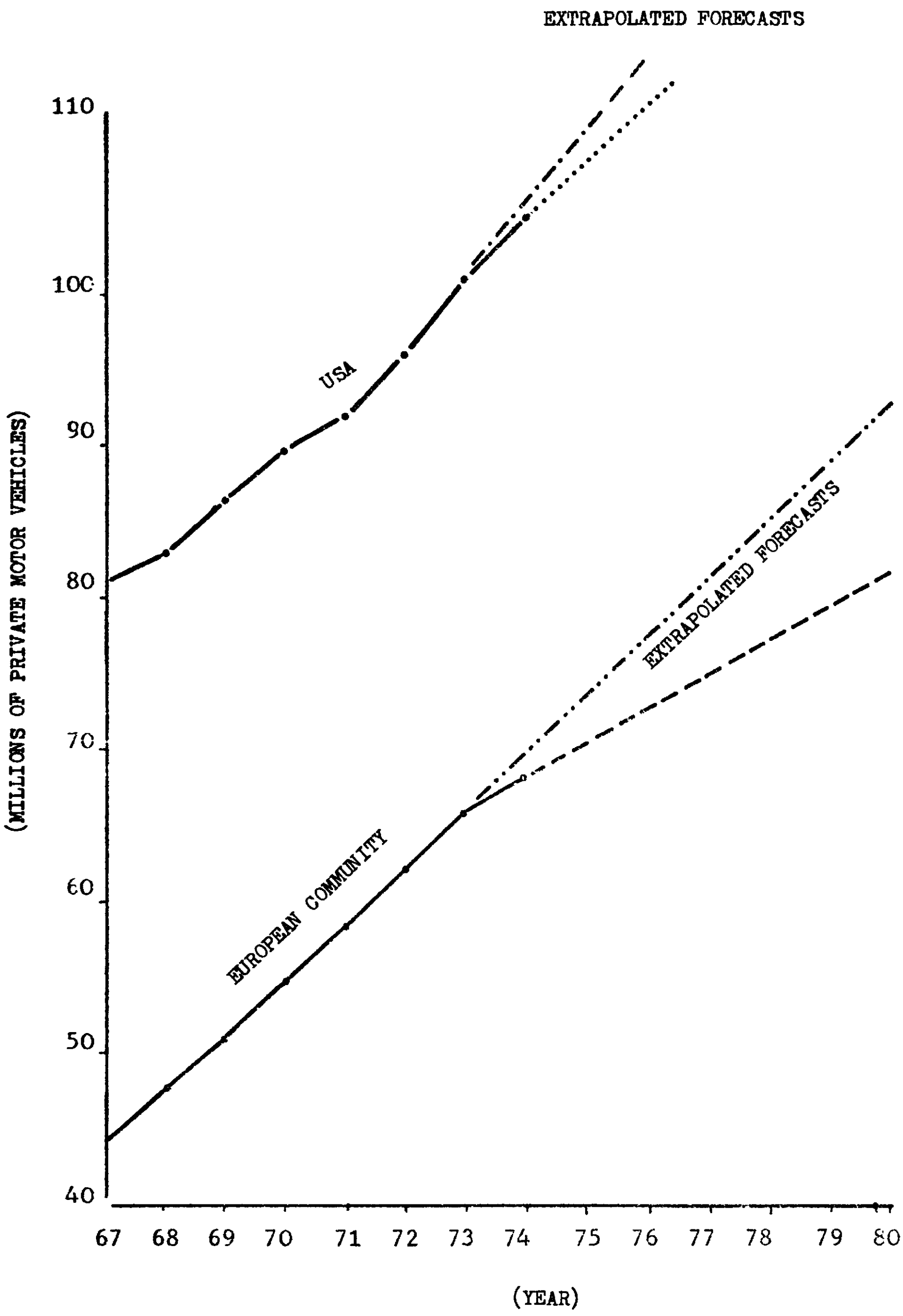
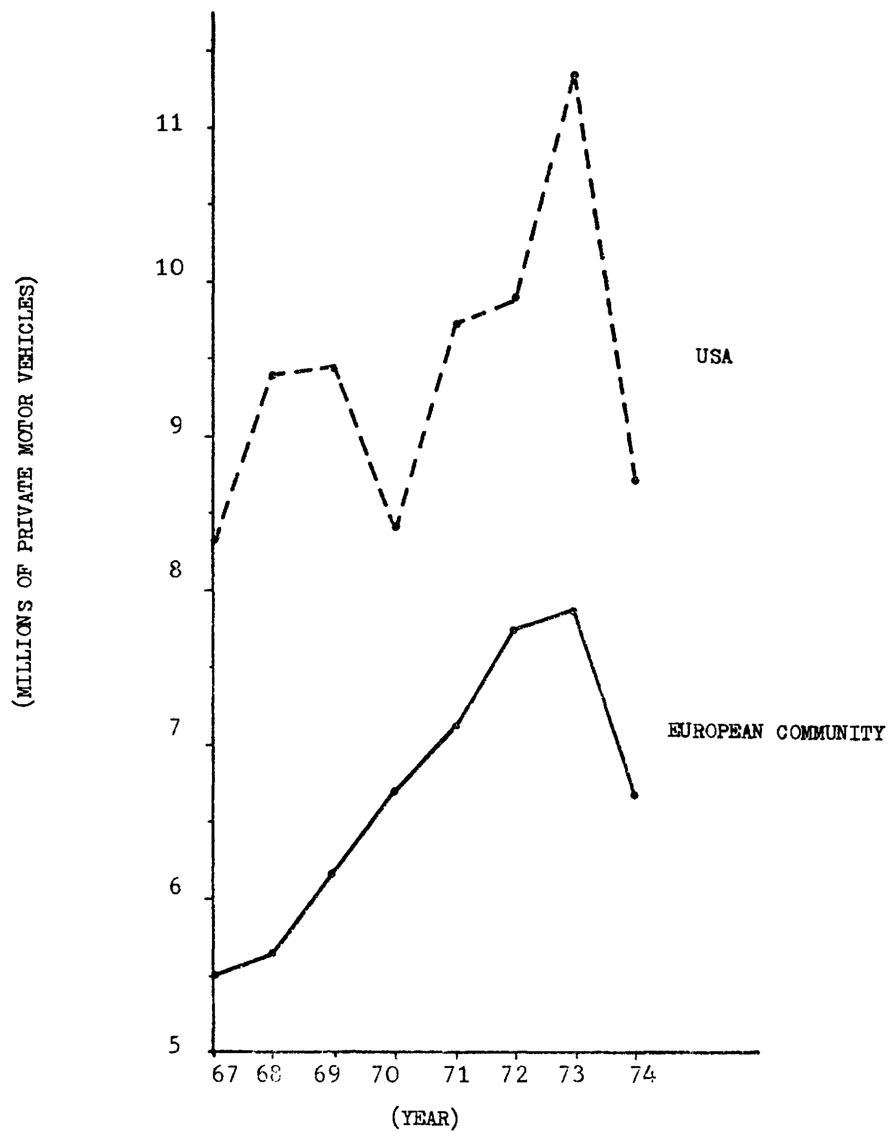


FIG. 2 - PRIVATE MOTOR VEHICLE REGISTRATIONS



- engine efficiency
- vehicle weight
- installed power
- effect of streamlining.

3.1.1. Efficiency

Figure 3 shows the thermal efficiency of various motor vehicle engines based on the guidance conditions of the American Federal Cycle for exhaust gas measurements [2,3]. The values shown are in respect of all the designs tested at the Ann Arbor EPA laboratories during 1973. Although these figures are not perfectly homogeneous even in the case of the conventional engines, on account of the NO_x level which differs from one design to another, they certainly provide a very valid picture of the efficiencies of present-day engines and an interesting comparison with engines of more recent design or at the R&D stage.

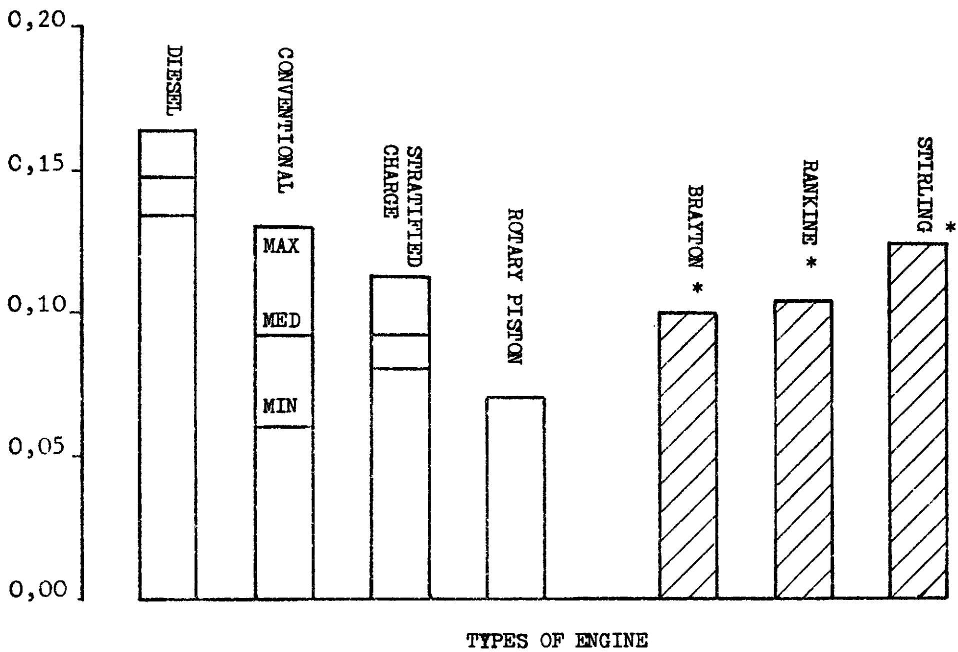
3.1.2. Vehicle weight

Figure 4 shows the breakdown of the weights of the new private motor vehicles registered in France, Germany, Italy and the United Kingdom in 1974. It can be seen that the differences are quite appreciable. In Italy, for example, 50% of such vehicles weigh less than 750 kg, whilst in Germany the corresponding value is 900 kg, i.e., 20% greater. And if the weight of 90% of such vehicles is considered, the difference is still more remarkable.

3.1.3. Installed power (cylinder capacity)

Investigation of the breakdown of the power installed in the motor vehicles of the countries which concern us is made extremely difficult by the diversity of procedures for defining the maximum power, and even more so by the diversity of power found for the various models of the same motor vehicle, even when the cylinder capacity of the engine installed is identical. For present purposes it is regarded as more realistic to give the breakdown of cylinder capacities. These values are shown in Fig. 5. The differences in cylinder capacities between France and Italy on the one hand and Germany and the United Kingdom on the other hand are, in this case too, about 20% in respect of the first 50% of motor vehicles. Between Europe and the USA, the corresponding difference is quite simply about 250% !

FIG. 3 - <u>EFFICIENCIES IN THE "FDC" CYCLE</u> [2]



* CALCULATED VALUES

FIG. 4 - WEIGHTS OF PRIVATE MOTOR VEHICLES REGISTERED IN SOME EUROPEAN COUNTRIES IN 1974

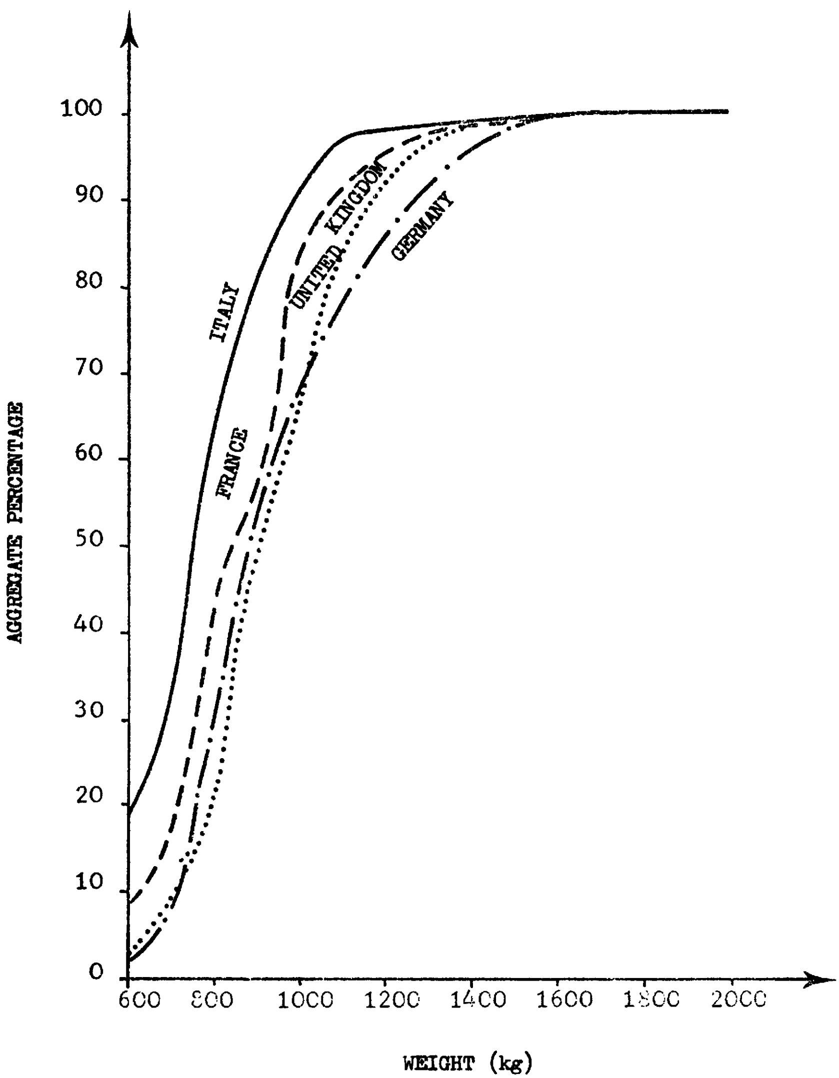


FIG. 5a - CYLINDER CAPACITIES OF THE PRIVATE MOTOR VEHICLES REGISTERED IN SOME EUROPEAN COUNTRIES IN 1974

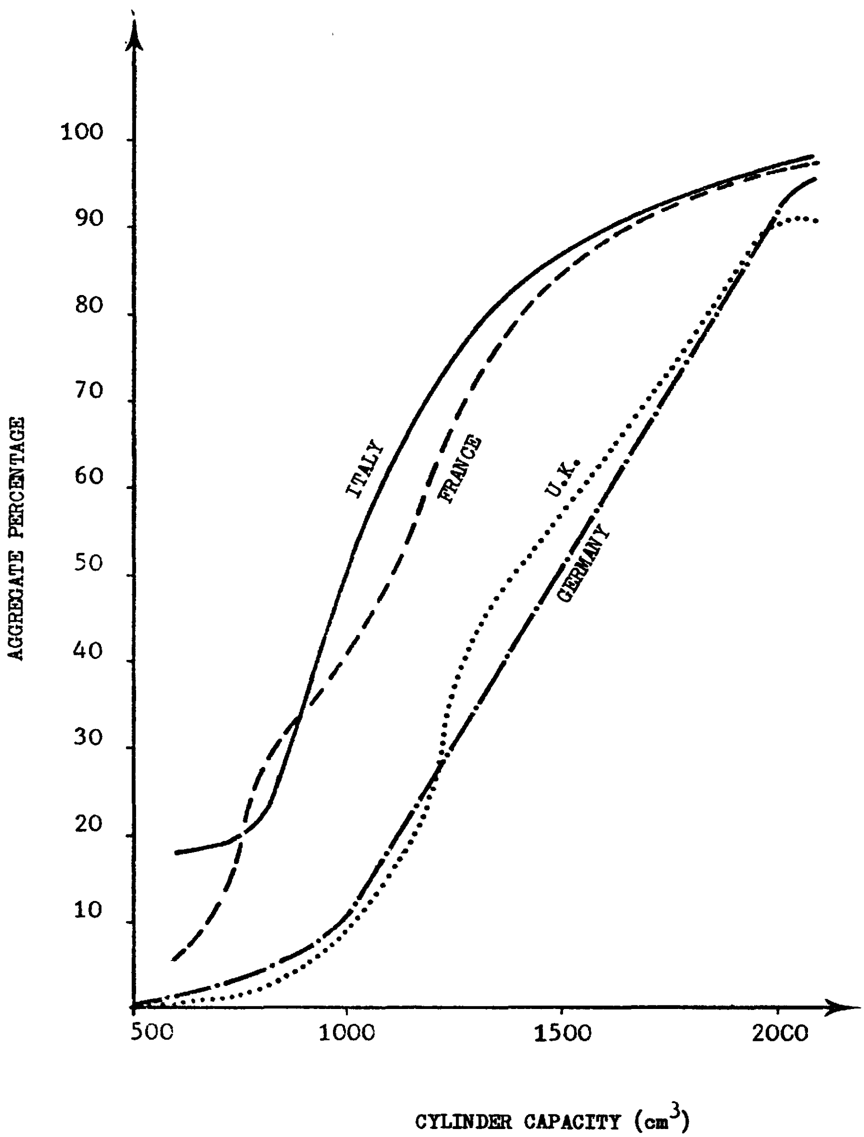
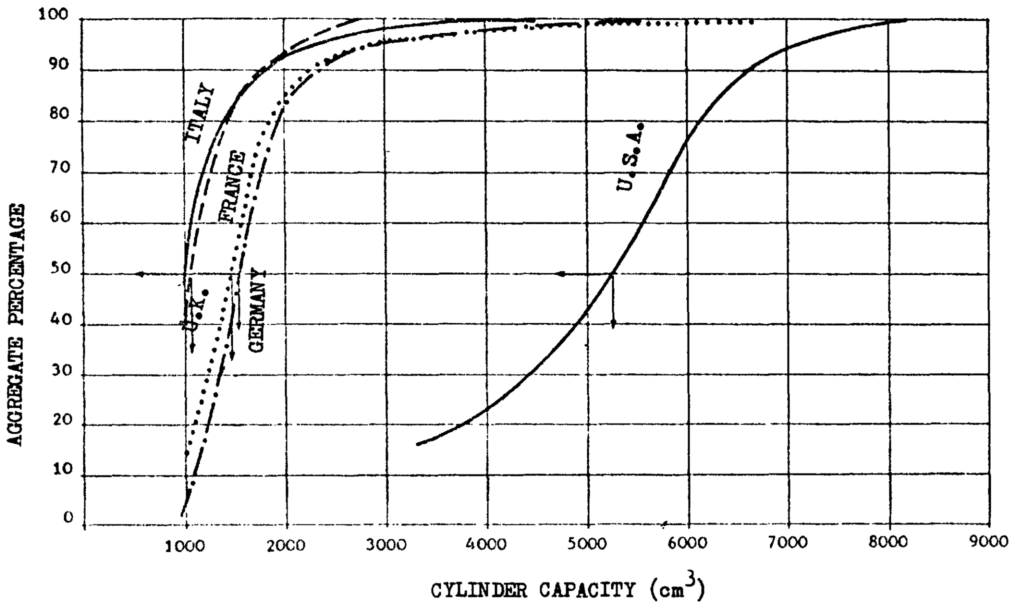


FIG. 5b — CYLINDER CAPACITIES OF THE PRIVATE MOTOR VEHICLES BUILT IN VARIOUS COUNTRIES IN 1974



3.1.4. Aerodynamic resistance

This factor, wich chiefly affects motorway traffic, cannot be readily expressed in a statistical form. However, in qualitative terms it can be reckoned as the factor least amenable to improvement in Europe, save for a few exceptions. As we have seen, the European private motor vehicle is fairly light, therefore small, and consequently has a small frontal cross-section. It is also easy to see that in Europe it is so much fashion that (with good taste or bad) demands streamlined designs but, on the contrary, it is generally the streamline that dominates fashion.

Although not strictly pertinent to the subject of this chapter, it may be added that from the standpoint of rolling resistance too, the position in Europe can be regarded as good, mainly owing to the wide use of radial pneumatic tyres and the efficiency of the suspension systems.

3.2. Energy in transport operations

As already mentioned in the Foreword, this Symposium should be able to identify some parameters concerning the rational use of energy in the motor vehicle sector, which in other words means using the least possible quantity of mineral oil derivatives for the same number of kilometres covered. It is therefore important to examine the present position regarding the production and consumption of petroleum products within the general energy picture.

Energy consumptions in 1973 are shown in Table 2 /4/. Table 3 gives the Community's energy balance sheet for 1973, which shows its net dependence on imports as regards the "Mineral oil" heading /5/. Table 4 gives the breakdown of Community mineral oil consumption in the various user sectors in 1973. Table 5 shows the percentage distribution in respect of the various modes of transport :

- motor vehicles
- other forms of road transport
- other transport modes.

Table 2 - ENERGY CONSUMPTION IN 1973 EXPRESSED IN TERMS OF PRIMARY SOURCES

	World (t.o.e.)	World (%)	USA (t.o.e.)	USA (%)	European Community (t.o.e.)	European Community (%)
Mineral oil *	2770	46.5	815	44.9	593	61.0
Natural gas	1025	17.2	549	30.3	115	11.8
Solid fuels	1779	29.9	362	20.0	223	22.9
Primary electrical energy	380	6.4	87	4.8	42	4.3
Total	5954	100.0	1813	100.0	973	100.0

(t.o.e.) = tonnes of oil equivalent

(*) including ships'bunkers

Table 3 - ENERGY BALANCE SHEET OF COMMUNITY PRIMARY SOURCES IN 1973

	Consumption (t.o.e.)	Consumption (%)	Production (t.o.e.)	Production (%)	Dependence on imports (%)
Mineral oil *	593	61.0	11	3.0	98.0
Natural gas	118	12.1	115	31.6	2.5
Solid fuels	221	22.7	199	54.7	10.0
Primary electrical energy	40	4.1	38	10.4	5.0
Other	1	0.1	1	0.3	0.0
Total	973	100.0	364	100.0	62.6

(*) including ships'bunkers

Table 4 - MINERAL OIL CONSUMPTION AND PERCENTAGE DISTRIBUTION OVER USER SECTORS IN THE EUROPEAN COMMUNITY IN 1973

	10^6 tonnes	%
Transport	119.2	20.1
Electrical energy	73.0	12.3
Industry	118.0	19.9
Domestic heating	143.5	24.2
Others *	139.3	23.5
Total	593.0	100.0

* Petrochemical industry, ships' bunkers, internal consumption and losses

Table 5 - ENERGY CONSUMPTION FOR TRANSPORT, SHOWN AS PERCENTAGES OF THE TOTAL ENERGY AND THE MINERAL OIL ENERGY IN 1973

	European Community		USA	
	% of total energy	% of min. oil energy	%of total energy	% of min.oil energy
Total energy	100.0	-	100.0	-
Mineral oil energy	61.0	100.0	45.0	100.0
Energy used in transporting	12.3	20.1	22.5	50.0
Energy used in motor vehicles	7.2	11.8	13.3	29.5
Energy used in other forms of road transport	3.2	5.3	4.1	9.2
Energy used in other transport modes	1.9	3.0	5.1	11.3

Table 6 - BREAKDOWN OF THE CONSUMPTION OF PETROLEUM PRODUCTS AND REFINERY PRODUCTION IN THE EUROPEAN COMMUNITY IN 1973

	Consumption		Production	
	10^6 tonnes	%	10^6 tonnes	%
LPG	11.3	1.9	11.2	1.8
Gasoline	72.9	12.3	76.3	12.1
Virgin naphtha	30.2	5.1	36.5	5.8
Paraffin (Kerosene)	19.0	3.2	25.7	4.1
Diesel fuel	173.8	29.3	187.2	29.8
Fuel oil	214.1	36.1	219.2	34.9
Others	33.2	5.6	34.3	5.4
Refinery consumption	38.5	6.5	38.4	6.1
Total	593.0	100.0	628.8	100.0

Table 7 - FORECAST CONSUMPTION OF VARIOUS PETROLEUM PRODUCTS IN THE EUROPEAN COMMUNITY

	1973		1980		1985	
	10^6 tonnes	%	10^6 tonnes	%	10^6 tonnes	%
Gasoline	73	12.3	84	13.7	93	13.8
Paraffin (Kerosene)	19	3.2	22	3.6	27	4.0
Diesel oil	174	29.3	175	28.5	182	27.0
Fuel oil	214	36.1	172	28.1	187	27.8
Others *	75	12.7	118	19.2	139	20.6
Self-consumption + Loss	38	6.4	42	6.9	46	6.8
Total	593	100.0	613	100.0	674	100.0

* including ships' bunkers

Table 8 - FORECAST CONSUMPTION OF PETROLEUM PRODUCTS IN THE EUROPEAN COMMUNITY BROKEN DOWN INTO USES

	1973		1980		1985	
	10^6 tonnes	%	10^6 tonnes	%	10^6 tonnes	%
Transport	119	20.1	144	23.5	164	24.3
Electrical energy	73	12.3	87	14.2	76	11.3
Industry	118	19.9	215	35.1	257	38.1
Domestic heating	144	24.3	127	20.7	127	18.9
Others *	139	23.4	40	6.5	50	7.4
Total	593	100.0	613	100.0	674	100.0

* including ships' bunkers

As will have been seen, the motor vehicle accounts for 12% of mineral oil consumption. Thus it is not the principal consumer. Nevertheless, since it does use and will continue to use energy derived from mineral oil, which is almost wholly dependent on imports, it is necessary to take a close look at consumption in this sector. For the same period, Table 6 shows the total consumptions of petroleum products and the refinery outputs in the Community. The data given are in respect of 1973, a period now overtaken from the standpoint of energy strategy, but certainly very expressive of the pre-crisis situation.

In the past, energy forecasts were, quite logically, based mainly on extrapolations of the trends of the previous period. Today, this method is no longer valid, both because the 1973 crisis created a break which prevents extrapolation and because the tendency of this market seems to be geared to adjusting demand to supply, rather than supply to demand as happened throughout the period up to 1973. The energy requirement must therefore be rationalized as much as possible and the future demand must somehow be guided in the light of a rational energy policy. The European Community is conducting a particularly searching study into energy forecasts; the initial estimates of the future consumptions of petroleum products in 1980 and 1985 are given in Table 7. Table 8 shows the forecast consumption of petroleum products broken down by type of use /6/.

4. CUTTING DOWN CONSUMPTION : AN ANALYSIS OF THE POSSIBLE SOLUTIONS

Classification of the factors affecting consumption

We think it expedient to divide the factors affecting motor fuel consumption into two main groups, even though this sub-dividing may be found arbitrary and insufficiently clear-cut. The two groups proposed are (*) :

- factors depending on the user
- factors depending on the design (this group also includes the solutions imposed by safety and emission control regulations).

(*) No account has been taken of factors which do not depend on either the user or the maker, such as town planning, road conditions, etc.

4.1. Factors depending on the user

- Annual mileage

- Choice of the type of motor vehicle

- Driving habits

- Servicing

- Vehicle occupancy factor.

It is a complex and difficult matter for the technologist to carry out a detailed examination of these factors. A sociologist could explain the choice of a motor vehicle as a "status symbol" and the psychologist could describe the mechanisms by which everyday frustrations are dispelled by aggressive, and therefore wasteful, driving. It is possible to offer the following summary observations :

4.1.1. Average mileage

This could only really be reduced if public transport services were to become so efficient as to make it easy and convenient to use them. The tax burdens on petrol have not done much to cut down mileage. The proof of this is the strong recovery of petrol consumption figures during the first half-year of 1975 compared with the corresponding period in 1974.

4.1.2. Choice of motor vehicle

People's choice can, as we have said, be steered towards low-consumption motor vehicles by selective taxation systems, but also by carefully planned government propaganda provided that it is matched and supported by the vehicle makers. This kind of cooperation should not be wanting, and the type of publicity now prevailing shows how far the makers have recognised fuel economy as an important factor of customer persuasion. Moreover, in addition to being in line with the Community's interest, such an attitude suits the interests of the motor vehicle industry. Take, for instance, the notion of using a second motor vehicle, intended purely for town use. The obvious energy advantages are also coupled with economic advantages as soon as the vehicle's city or suburban journeys exceed 25 000 km/year.

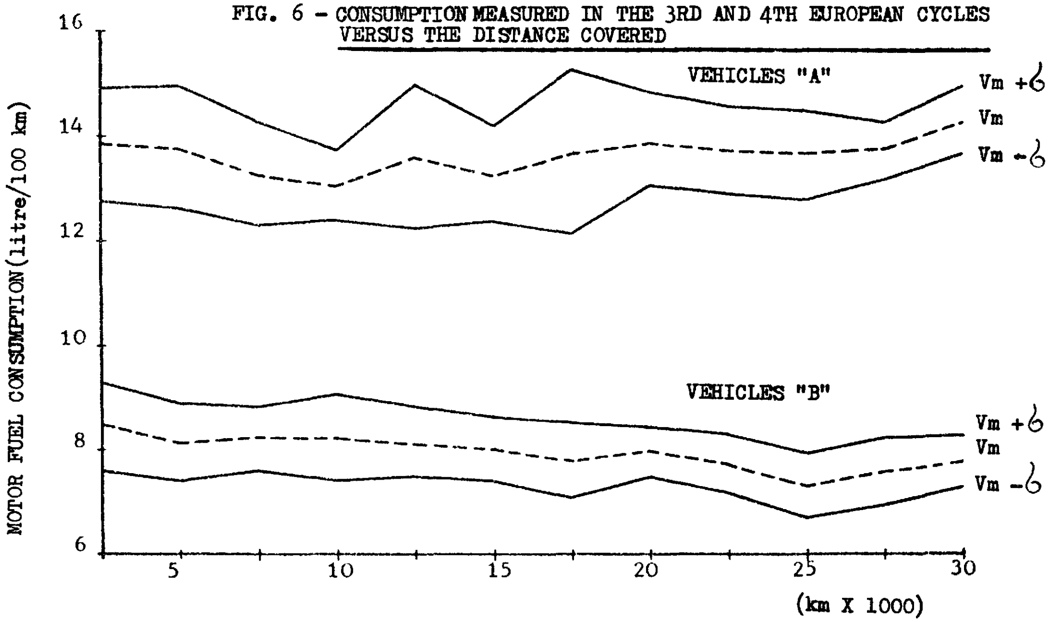
4.1.3. Driving habits

Driving habits can also be conditioned by persuasive propaganda campaigns, by suitable speed limits and by stricter repression of highway code offences. The increase in petrol duty does not seem to have had much success in this case either; one need only look at the urban traffic ... The persuasive efficiency of some simple instruments, giving the driver an idea of how much he consumes in relation to how he drives, could be tried out and if the result is satisfactory their use could be suggested.

4.1.4. Servicing

Correct servicing of the motor vehicle unquestionably has a very marked effect on the consumption of motor fuel. The attitude of motorists towards their vehicles varies very widely, however, and it will not be easy to alter it. The situation in regard to the compulsory testing of the motor vehicles in use differs greatly from country to country, and some countries will have considerable difficulty and enormous expense in achieving an efficient compulsory testing system. It is necessary, however, that the Community bring order into this sector and that the tests on the functioning of the components that affect consumption be given special prominence.

FIG. 6 - CONSUMPTION MEASURED IN THE 3RD AND 4TH EUROPEAN CYCLES VERSUS THE DISTANCE COVERED



WEIGHT OF A PRIVATE MOTOR VEHICLE "A" = 820 kg

WEIGHT OF A PRIVATE MOTOR VEHICLE "B" = 525 kg -

Figure 6 shows the changes in consumption recorded in a fleet trial on 186 Italian private motor vehicles of two different models over a distance of 30 000 km, starting with brand-new engines. The servicing, at 10 000 km intervals, consisted only in changing the sparking plugs and checking the ignition system without adjusting the carburettor. It can be seen that there is no necessity for excessively complicated and expensive checks, but rather for frequent checks centred on the really important components.

4.1.5. Vehicle occupancy factor (VOF)

This factor given by the ratio of the number of seats occupied to the number of seats available in the vehicle. Table 9 [7] shows the variation in the Net Propulsion Efficiency (NPE) versus the VOF for various types of vehicles in urban traffic. An examination of this Table indicates that the present private motor vehicle could be a really economic means of transport if only the users could be successfully persuaded to use it at the high VOFs. This is a very important problem because it can affect consumption to a far greater extent than all the other factors considered. Unfortunately, however, it appears extremely difficult to identify measures capable of affecting it. This being so, and given its importance, contributions for a correct approach to the study of this problem should be invited.

4.2. Factors depending on the design

- Engine efficiency
- Vehicle weight
- Installed power
- Type of engine.

4.2.1. Engine efficiency

Improving the efficiency of the internal combustion engine has been and is still one of the chief cares of the vehicle makers and the results of their continual work have been very considerable, even though the surrounding conditions have often forced them to change their specific objectives.

Table 9 - NET PROPULSION EFFICIENCY (OCCUPANTS PER KM/LITRE) OF AMERICAN AND EUROPEAN PRIVATE MOTOR VEHICLES VERSUS VEHICLE OCCUPANCY FACTOR

	Vehicle occupancy factor	Net propulsion efficiency (occupants per km/litre)
Urban traffic		
Average European private motor vehicle with a single occupant	0.20	6.7
Small European private motor vehicle with a single occupant	0.25	10.7
Average European private motor vehicle with three occupants	0.65	17.1
Small European private motor vehicle with three occupants	0.75	32.2
American private motor vehicle with a single occupant	0.17	2.3
American private motor vehicle with four occupants	0.65	9.4
European urban bus	0.65	43.6 - 50.3
Non-urban traffic		
Average European private motor vehicle travelling at 120 km/h with a single occupant	0.20	9.2
Average European private motor vehicle travelling at 120 km/h with three occupants	0.65	30.0

Here we refer more especially to the provisions regarding exhaust emissions which, particularly in the case of the oxides of nitrogen, have obliged the designer to abandon certain improvements of efficiency in order to find more suitable compromise solutions. From this angle the situation in Europe is not unpromising. Figure 7 shows the consumption of motor traffic representative of the private vehicles in use in Italy, plotted against emission limits. It can be observed that the current limits have caused consumption figures to drop in comparison with 1970; they will rise only when CO and HC reductions of 65% and beyond are imposed. This is, of course, if too severe limits are not laid down for NO_x.

Such a volume of studies exists at every level on the efficiency problem that this does not seem to be the place for tackling it in detail [2, 8, 9].

On the other hand, it is worthwhile to examine the problem more thoroughly by considering the overall efficiency of the conversion of energy, starting from the refinery and finishing at the engine. This is now a routine concept : the two factors which contribute to fuel consumption are considered together in order to ensure that engine consumption does not increase when the energy cost (*) of the gasoline is reduced, and vice-versa. The concept can be put in the following way :

a) identifying, for one or more refining structure-models, the energy cost of producing gasoline at various Octane Numbers (ON);

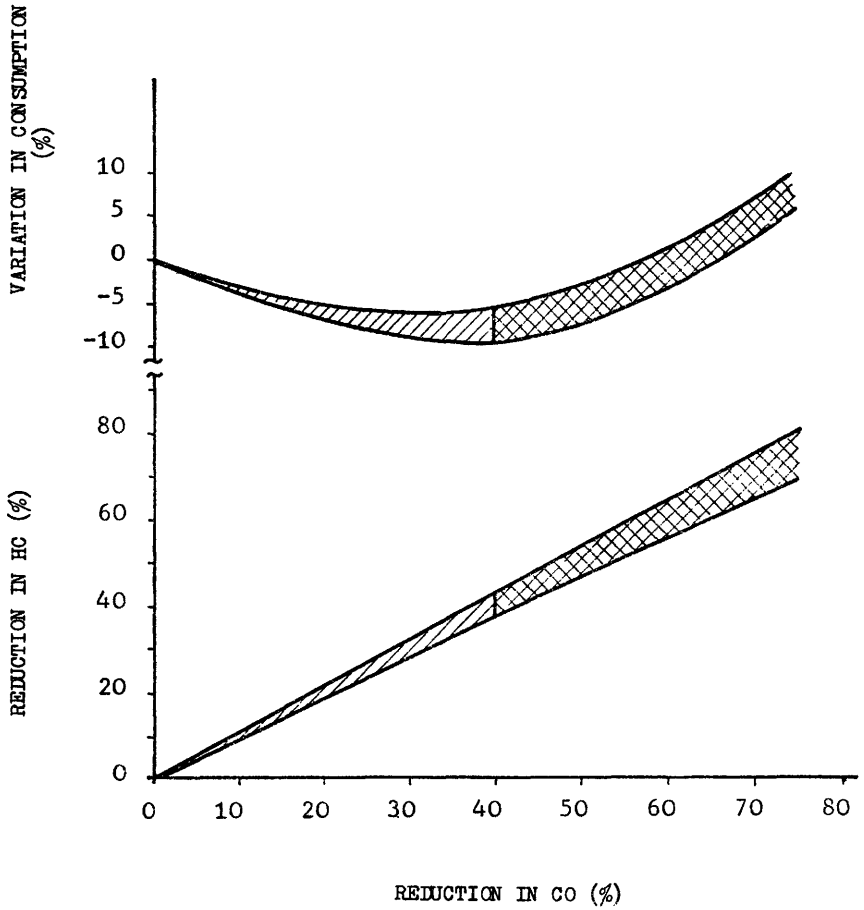
b) defining, for the European private motor vehicle of today and tomorrow, the curve of consumption versus compression ratio;

c) defining, for the same private motor vehicle, the curve of Octane Requirement (OR) versus compression ratio;

d) obtaining from b) and c) the curve of consumption versus ON,

(*) "Energy cost" of a petroleum product means the number of calories expended in producing it.

FIG. 7 - PERCENTAGE VARIATION IN CONSUMPTION AND PERCENTAGE VARIATION IN THE HC CONTENT OF THE EXHAUST GASES VERSUS THE PERCENTAGE VARIATION IN THE CO CONTENT OF THE EXHAUST GASES



e) processing the functions a) and d) in such a way as to identify the ON which minimizes the overall calorie consumption, i.e., both the calories used in the engine and those expended in production.

The example which we propose is only one pattern of approach to the actual problem. The difficulties in identifying quantitatively the functions necessary for solving the problem are really enormous. Let us take only one example, which concerns the function ON = f (ρ). Figure 8 shows the Octane Requirement expressed in terms of the primary reference motor fuels in ten specimens of the same model of private motor vehicle.

It must be noted that this range of ON requirements is not at all exceptional but is characteristic of the vast majority of private motor vehicles, and therefore the selecting of absolute values is so haphazard an operation as to expose anyone who tries to do so to facile accusations of arbitrariness. From this it follows that an effort on the part of the motor vehicle industry to reduce this variation in OR and eliminate the extremes could have far-reaching effects on the ON of the gasoline to be produced, with consequent far-reaching savings of energy.

Equally ticklish problems arise when defining the refinery conditions and the procedure for performing the relevant calculations. The basis of our example is a refinery representative of the average in Europe as regards the processes used in the production of gasoline.

A look at Table 10 shows sufficiently clearly the procedure by which the consumption calculations are carried out. It is important to remember that nothing but energy considerations are involved; the economic aspects (capital investment, higher production costs, etc..), which are also very important, have not been quantified and we have simply identified the levels at which new capital outlay would be necessary.

The values of the reductions in gasoline consumption versus the On have been deduced from the most recent published works [10, 11].

The results are summarized in the graph in Figure 9.

It follows that the ON value which minimizes the actual consumption of calories is a function of the gasoline's lead content, namely, 98-99 for 0.6 g/litre, about 97 for 0.4 g/litre and 95 for 0.15 g/litre. Thus the current position in Europe seems to be not far removed from the optimum condition for lead contents of not less than 0.4 g/litre.

FIG. 8 - OCTANE REQUIREMENT (PRF) AT DIFFERENT SPEEDS

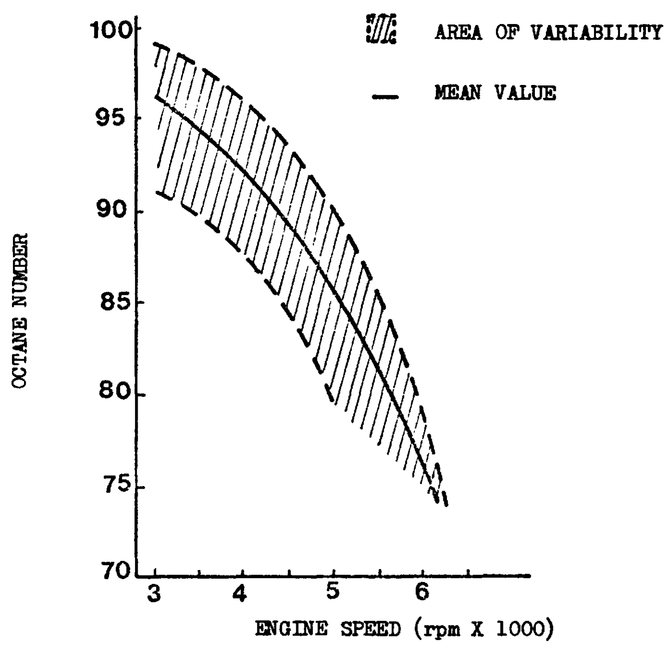


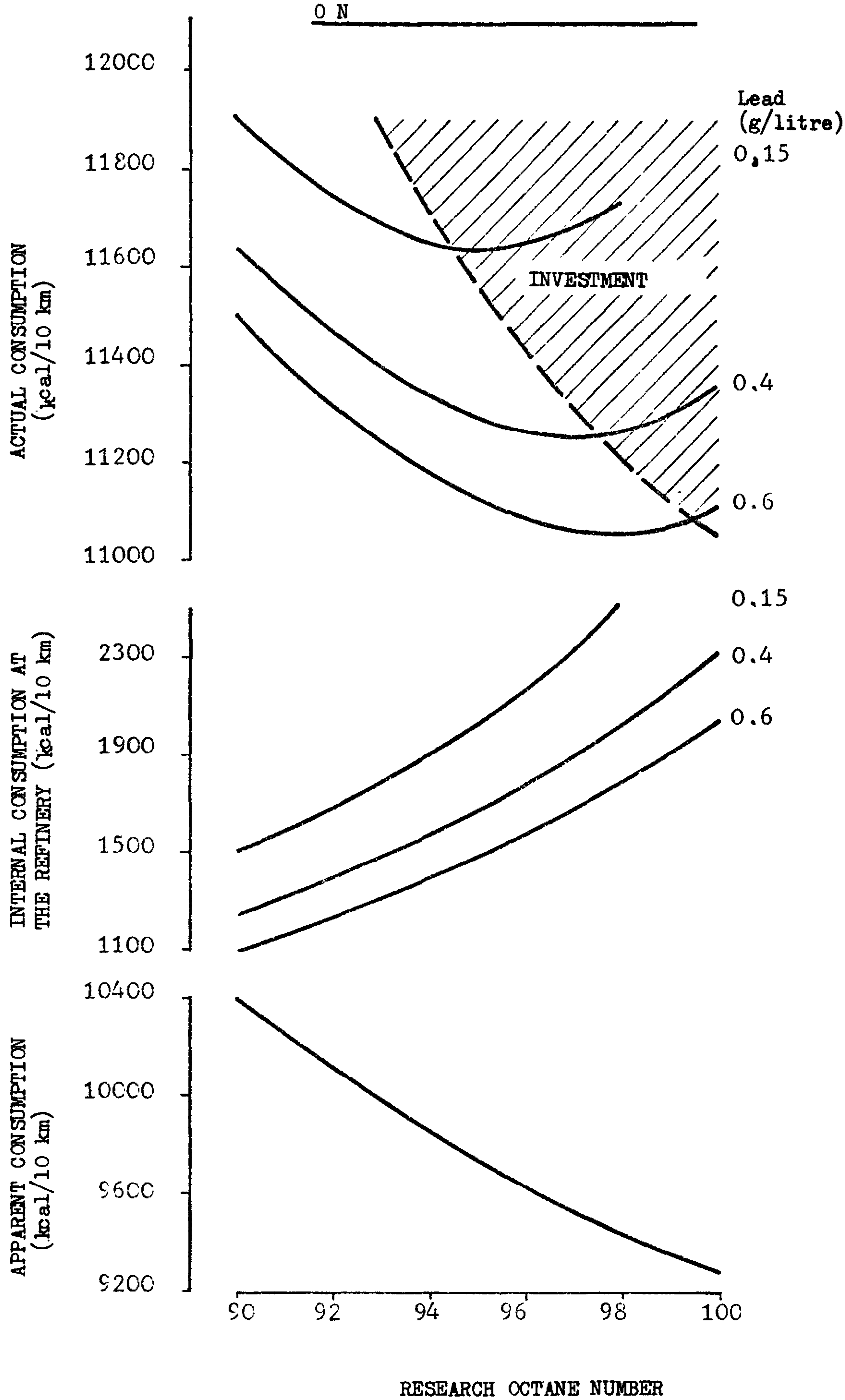
Table 10 - ACTUAL ENERGY CONSUMED IN COVERING 10 km (*)

R O M	Percentage decrease in engine consumption	Apparent engine consumption (kcal/10 km) (**)	Internal consumption at refinery (kcal/kg)			Actual consumption per 10 km (kcal/10 km)		
			Pb (g/litre)			Pb (g/litre)		
			0.6	0.4	0.15	0.6	0.4	0.15
90	0.0	10400	1100	1230	1510	11500	11630	11910
91	1.3	10255	1160	1312	1586	11400	11550	11820
92	2.6	10110	1232	1407	1684	11310	11480	11750
93	3.9	9966	1325	1503	1794	11240	11410	11690
94	4.9	9852	1396	1565	1891	11180	11340	11650
95	5.9	9739	1478	1659	2010	11130	11300	11630
96	6.9	9627	1571	1754	2173	11090	11260	11650
97	7.9	9514	1679	1885	2352	11060	11250	11680
98	8.7	9422	1783	2013	2517	11050	11260	11720
99	9.4	9341	1897	2162	-	11060	11300	-
100	10.0	9270	2033	2311	-	11100	11350	-

(*) The calculations are based on a private motor vehicle which consumes 1 kg of gasoline in covering 10 km.

(**) The calculation of apparent engine consumption (column 3) takes account of the variation in calorific values with ONs.

FIG. 9 - VARIATION IN APPARENT AND ACTUAL CONSUMPTION (CONSUMPTION IN THE ENGINE AND AT THE REFINERY) WITH O N



As we have stated, this exercise employs too many over-simplified hypotheses, both engine-wise and refinery-wise, to be able to constitute an exact reference on which to base the final decisions on this subject. A cooperative programme of experimental work for tackling this problem on the lines of the exercise described has been in preparation for some time now; the Commission should, as a matter of importance, intervene to help the participants to surmount the difficulties and to encourage them, through its support, to execute it completely and quickly.

4.2.2. Vehicle weight

Weight is usually regarded as the factor having the greatest effect on the fuel consumption of a private motor vehicle; it is therefore worth examining with some care.

Figure 4 shows the breakdown by weight of the motor vehicles in use in four countries of the Community.

Table 11 gives the consumption figures of two private motor vehicles representative of the weight of 50% of the motor vehicles in use in Italy and Germany. Many data on this subject are available in the literature. Figure 10 shows average consumption versus weight of the private motor vehicles tested in the EPA laboratories in 1973 [2]. Unfortunately, these data are marred by the fact that, whilst the weight of a motor vehicle can vary, so also can its dimensions and installed power which, as we shall observe further on, have a great influence on consumption.

Nevertheless, it is of interest to examine Figure 11 which shows simultaneously the effects of the motor vehicle's weight and performance on the consumption. The consumption calculation is based on an average running of 55% in urban use (Federal Driving Cycle) and 45% in non-urban use.

FIG. 10 - MOTOR FUEL CONSUMPTION VERSUS MOTOR VEHICLE WEIGHT

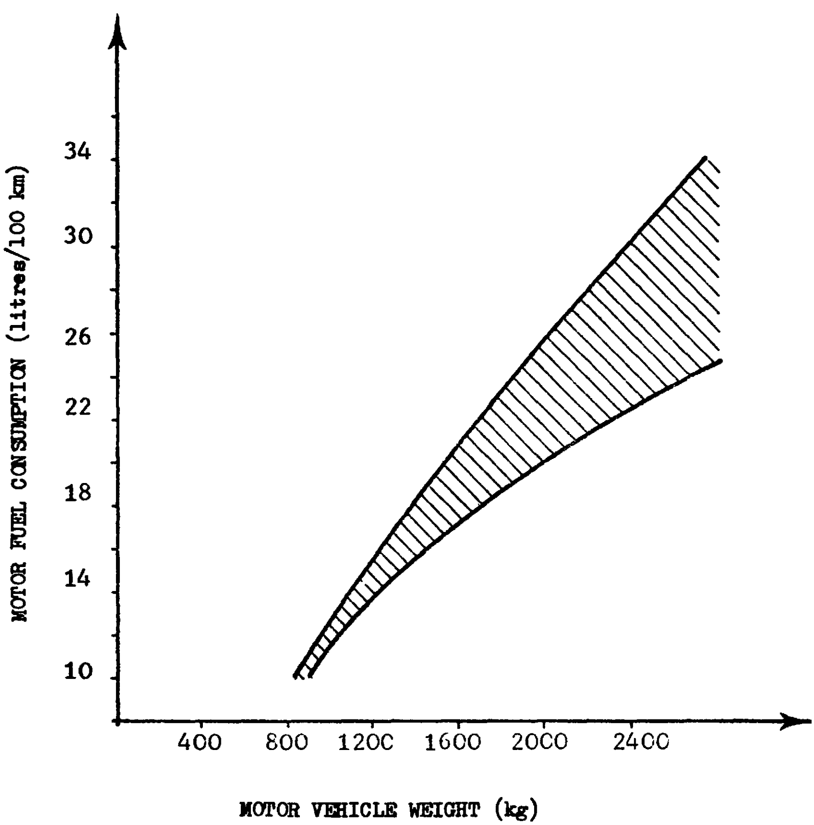
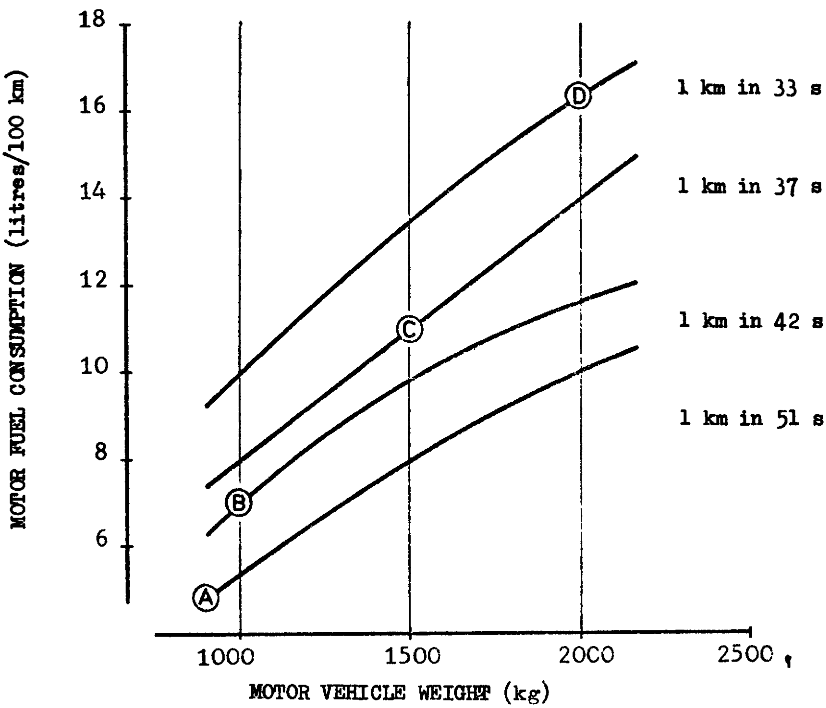


FIG. 11 - VARIATION IN MOTOR FUEL CONSUMPTION WITH MOTOR VEHICLE WEIGHT AT DIFFERENT LEVELS OF PERFORMANCE

MOTOR VEHICLE	FULLY LADEN WEIGHT (kg)	MAXIMUM SPEED (km/h)	STANDING KILOMETRE (s)
A	900	110	51
B	1000	140	42
C	1500	160	37
D	2000	190	33



The characteristics of the standard private motor vehicles in question are shown in the following table :

Motor vehicle	Maximum speed (km/h)	Fully laden weight (kg)	Standing kilometre (s)
A	110	900	51
B	140	1000	42
C	160	1500	37
D	190	2000	33

The continuous lines indicate the increase in consumption with increasing weight for the same motor vehicle performances, whilst each straight vertical line indicates the variation in consumption with varying performances at a constant motor vehicle weight. If, for example, we take vehicle A with a weight of 900 kg and increase it to 2000 kg without varying its performance, the average consumption goes up from 4.8 litres/100 km to 10 litres/100 km, an increase of 108.4%. If, on the other hand, we wish to change the engine, but not the weight, of motor vehicle D, depressing its performance to the level of motor vehicle A, the consumption drops from 16 litres/100 km to 10 litres/100 km, a drop of 37.5% [12].

In contrast, if only the weight is varied, the variations in consumption are naturally much less. The following table shows the consumptions, measured in the Federal (USA) cycle, of two private vehicles the weights of which were increased merely by loading them with ballast :

	Weight (kg)	FDC consumption (litres/100 km)	Variation (%)
Motor vehicle A	820	10.5	10.5
	1060	11.6	
Motor vehicle B	1060	11.6	7.8
	1400	12.5	

The differences in the European cycle are slightly lower, mainly because of the preponderance of idling tests, in which the weight does not have any effect. Since its importance is far from negligible, vehicle weight as such poses the problem of building private motor vehicles with less weight for the same size, by selecting lighter materials.

This is a very complex subject which has to be viewed in an overall energy context. The problem will be discussed in the last chapter. A system of taxation on the weight of the private motor vehicle might, as we have mentioned, be to the detriment of large families or tradesmen who use their vehicles for carrying out small transport operations. The problem calls for a more searching study of how to deal with it in an organic law designed to save energy.

4.2.3. Power installed in the private motor vehicle

Although this element has important psychological ramifications affecting driving habits, we shall deal only with the aspect that may be defined as the "utilization factor" (UF), which expresses the ratio between the power used and the power available.

To examine the influence of this factor a private motor vehicle was used, weighing 1.100 kg and equipped with its standard engine (A) developing 126 h.p. at 6,000 r.p.m. to give a maximum speed of 180 km/h. On the same vehicle was substituted an engine (B) developing 59 h.p. at 6,000 r.p.m., the settings of which were adjusted to obtain the same specific consumptions as engine (A) at equal engine speeds and feed pressure. The gearing was adapted to obtain in the second case as well a maximum speed at the revolutions of maximum power. The trials were carried out with 98.4 RM premium gasoline without pinking being detected in either case. Figure 12 shows the vehicle utilization curve and the power and ISO-consumption curves for two engines involved.(*) The areas outlined represent the use of power in the European cycle and in the Federal (USA) cycle. Table 12 gives the consumptions at constant speed, in the European cycle and in the Federal cycle, together with the performances with the two different engines. Engine B's consumptions are more advantageous at constant speed than in the two cycles. This is probably due to the fact that whereas on the utilization curve the consumptions of engine B had been exactly "modelled" on those of engine A, at lower ratings - and particularly at idling speed which features prominently in the European cycle - engine B had not been so much "optimized".

(*) The ISO-consumption curves have been drastically "linearized" to make the graph understandable; but the consumption values are exact at the points of intersection with the utilization curve.

Table 11 - MOTOR FUEL CONSUMPTION MEASURED IN A FLEET TRIAL OF 55 MODEL A AND 97 MODEL B PRIVATE MOTOR VEHICLES, VERSUS VEHICLE WEIGHT AND TYPE OF RUN

Model	Weight	Consumption (litres/100 km) urban	non-urban	motorway	average
A	850	12.8	9.8	9.0	10.4
B	705	8.3	7.2	8.2	7.9
$\frac{A-B}{A}$ %		35.2	26.5	8.9	24.0

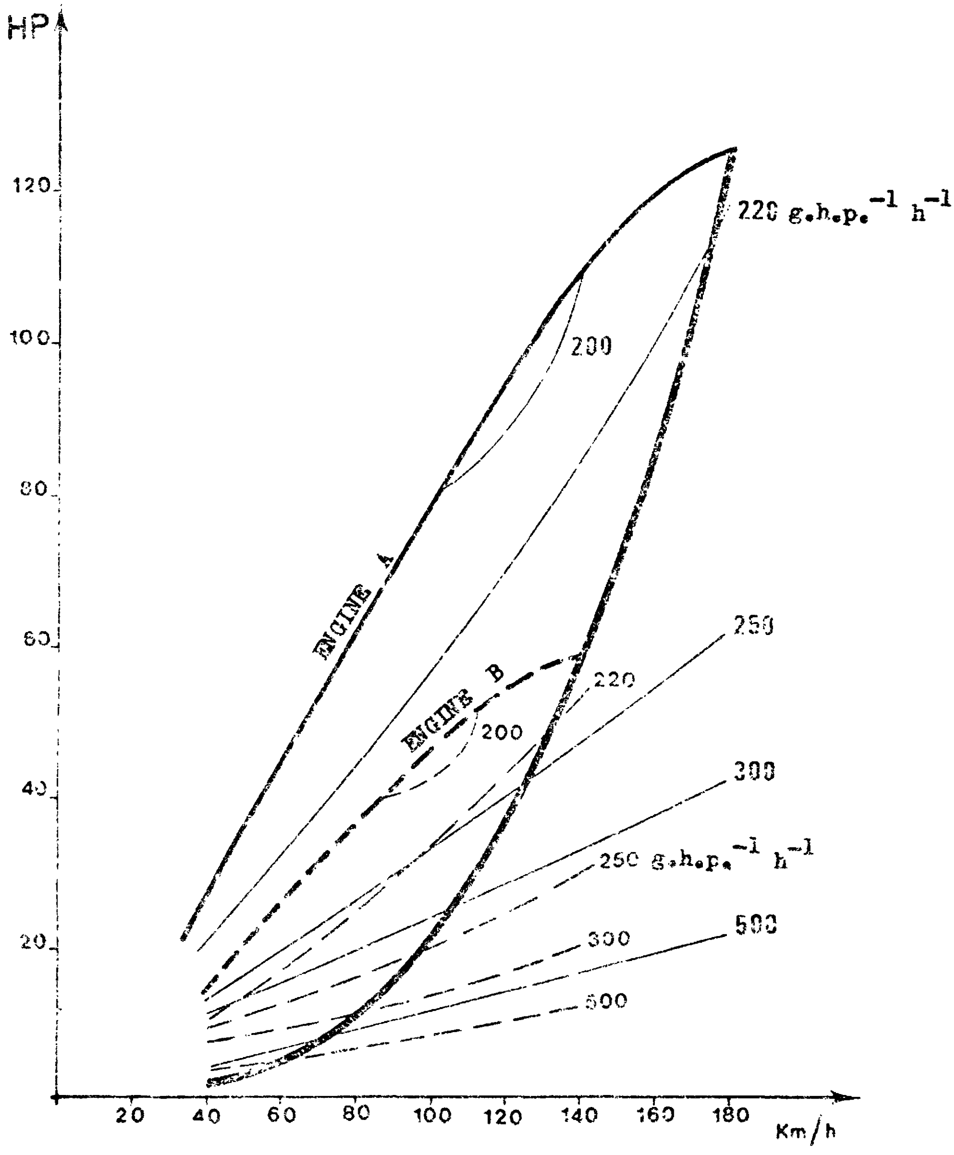
Table 12 - CONSUMPTION OF A PRIVATE MOTOR VEHICLE EQUIPPED WITH TWO ENGINES OF DIFFERENT PERFORMANCES AND RUN IN VARIOUS CONDITIONS OF OPERATION

	Consumption (litres/100 km) Engine A	B	$\frac{A-B}{A}$ %
At a steady (100 km/h)	11.2	9.5	15.2
European cycle	13.9	12.4	10.8
Federal (USA) cycle	11.6	10.2	12.1
Maximum speed (km/h)	180	140	22.2
Standing kilometre (s)	33	42	-27.3

FIG. 12 - POWER AND SPECIFIC CONSUMPTION VERSUS SPEED FOR THE FOLLOWING ENGINES

ENGINE A - 125 h.p. V max = 180 km/h

ENGINE B - 59 h.p. V max = 140 km/h



However, even in these circumstances the economy obtained is far from negligible and suggests that this problem should be looked into carefully.

The real question is whether it is appropriate to include this factor of consumption among those depending on the maker or whether it should rather be regarded as one depending on the user.

This dilemma involves too many factors that are outside the competence of the technologist; the one certainty is that we must keep the American utilization factors in mind as an example of unjustified extravagance, not entitling us to satisfaction with our circumstances which are already much better but spurring us to improve them still further.

4.2.4. Type of engine

4.2.4.1. Diesel engine

The use of the diesel engine in private motor vehicles in the Community is spreading rapidly (Figure 13). The spread is greatest in Germany where a local manufacturer has for many years conducted a shrewd promotional policy for the "private diesel motor vehicle", mainly by keeping the price at levels comparable with those of the corresponding gasoline models (Table 13). This explains (Figure 14) the reason for the widespread presence of private diesel motor vehicles in Germany where the retail prices of the diesel fuel are not very advantageous in comparison with gasoline. Nevertheless, if we observe the increase in the number of "private diesel motor vehicles" rather than their total, the effect of the lower cost of the diesel fuel amounts to a determining factor in the expansion of this kind of private vehicle in the countries of the Community (13).

Let us come now to the problem which interests us the most, namely, the examination of the consumption of a gasoline engine in comparison with that of a high-speed diesel engine. The reporter's task should be that of finding a precise, unequivocal solution, presenting it with clarity and justifying it. Unfortunately, while it is easy to point out that, in the case of the private vehicle models now available with either a gasoline or a diesel engine, the consumption is lower with the latter, it is very hard to identify this difference quantitatively. Table 14 is a clear example of how the figures are variable according the view point to (14).

FIG. 13 - **PRIVATE DIESEL MOTOR VEHICLE REGISTRATIONS**

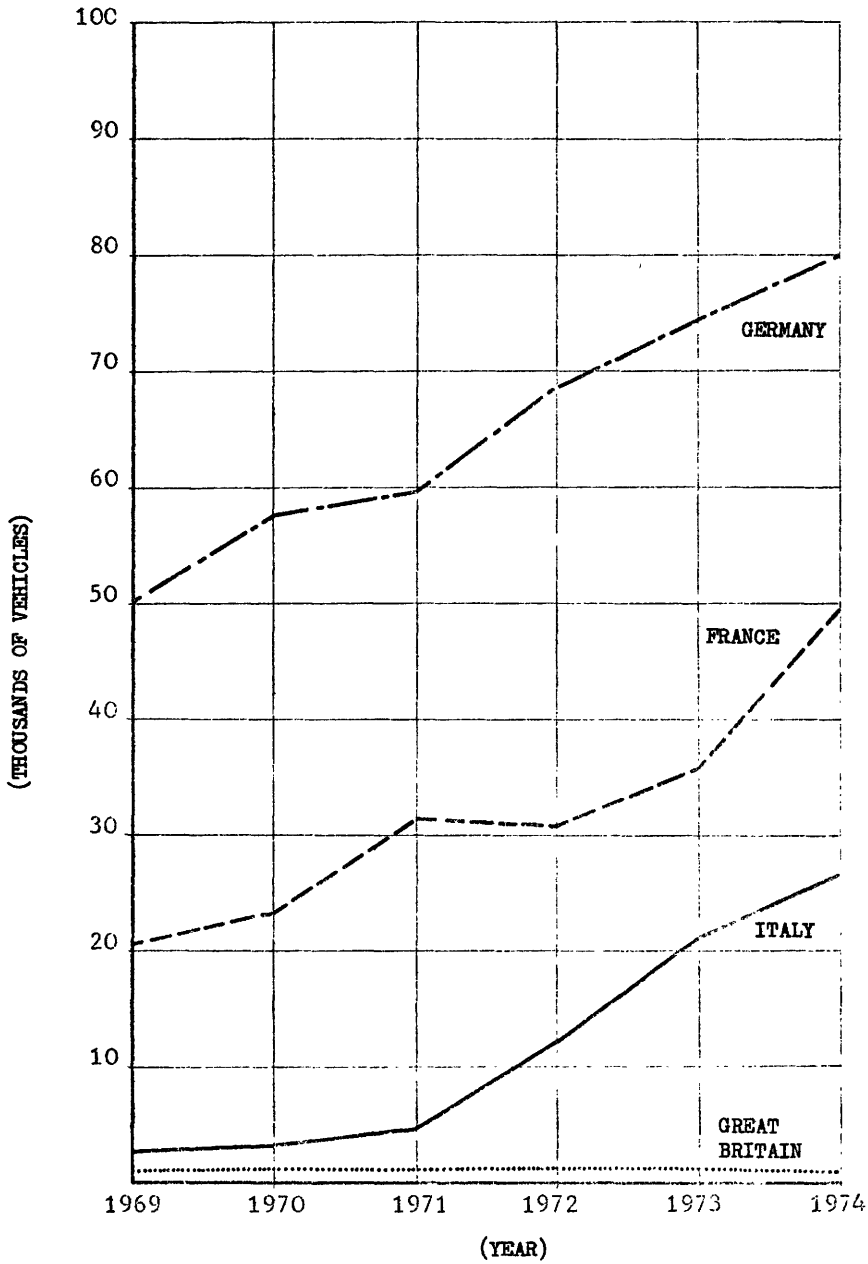


FIG. 14 - PRIVATE MOTOR VEHICLES EQUIPPED WITH DIESEL ENGINES REGISTERED OVER THE PERIOD FROM 1970 TO 1974

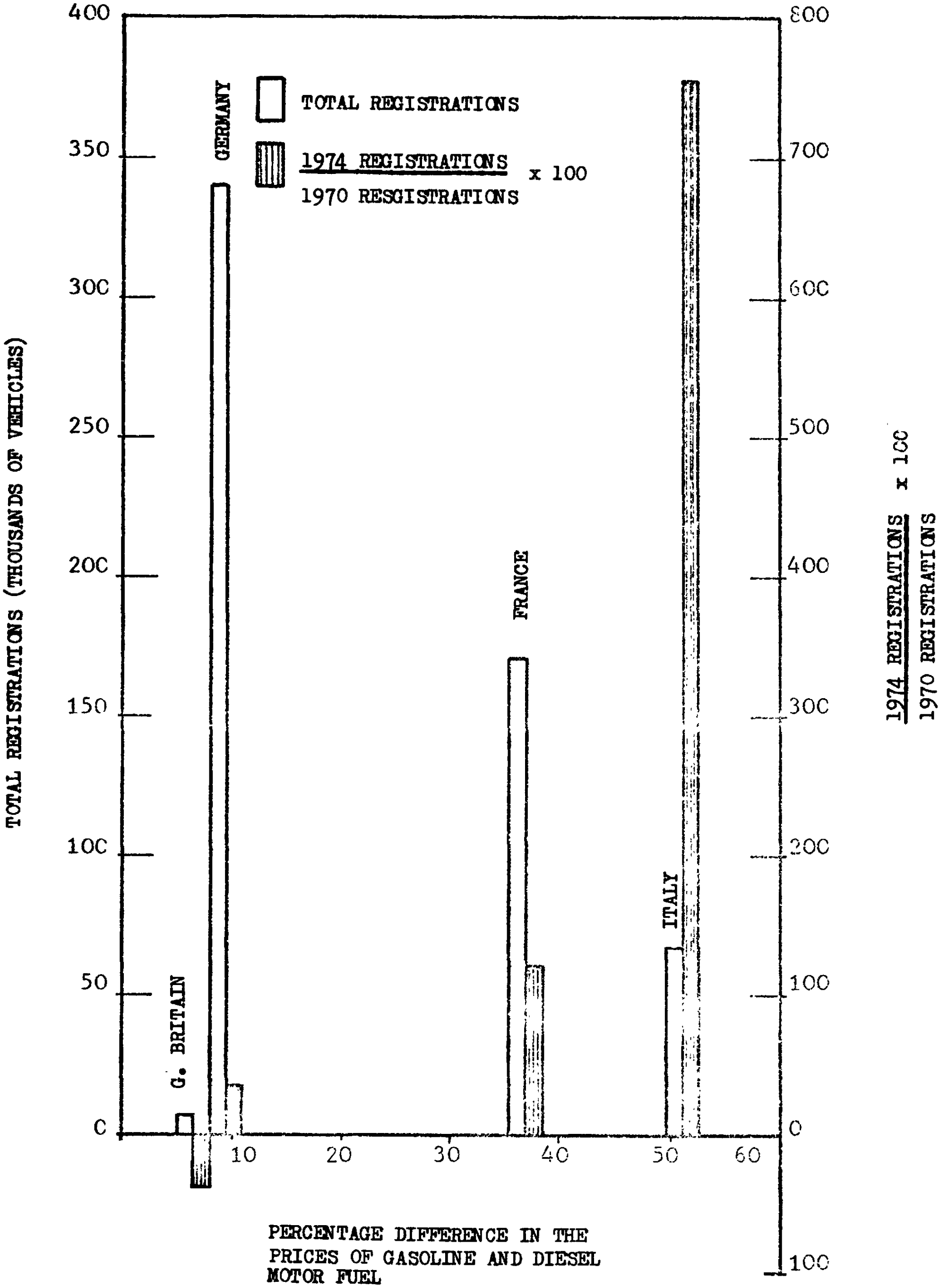


Table 13 - COMPARISON OF THE PRICES OF THE GASOLINE AND DIESEL VARIANTS OF SOME POPULAR MAKES AND MODELS OF PRIVATE MOTOR VEHICLES (OCTOBER 1975 PRICES)

Make and model	Gasoline	Diesel	Difference (%)
Peugeot 504 G.L.	FF 27 000		+ 19.8
Peugeot 504 L.D.		FF 32 350	
Peugeot 204	FF 19 800		+ 19.7
Peugeot 204		FF 23 700	
Opel Rekord 2000 S	DM 13 188		+ 11.8
Opel Rekord 2000 D		DM 14 750	
Mercedes 200	DM 16 705		+ 2.9
Mercedes 200 D		DM 17 183	
Mercedes 250	DM 21 623		- 7.9
Mercedes 240 D 3.0		DM 19 914	

Table 14 - COMPARISON OF THE VOLUME AND WEIGHT CONSUMPTIONS OF THE GASOLINE AND DIESEL VARIANTS OF THE SAME MODEL OF PRIVATE MOTOR VEHICLE

Make and model	Driving conditions	Consumption per 100 km					
		Gasoline (A)		Diesel (B)		$\frac{A-B}{A}$ %	
		litres	kg	litres	kg	volume	weight
Peugeot 204	in town	10.2	7.6	6.9	5.7	32	25
	out of town at max. of 90 km/h	6.5	4.9	5.5	4.6	15	6
	at a steady 120 km/h	8.8	6.6	9.0	7.5	-2	-14
Peugeot 504	in town	15.5	11.6	9.0	7.5	42	35
	out of town at max. of 90 km/h	8.2	6.2	7.0	5.8	15	6
	at a steady 120 km/h	10.3	7.7	10.2	8.5	1	-10

The relevant literature is very profuse and well known to all. The research in progress could substantially alter the current state of affairs,(one need only consider the enormous advantages in terms of consumption that would be obtained if direct-injection high-speed diesel engines could be successfully developed).

Here, therefore, we shall confine ourselves to summarizing the pros and cons of the diesel engine as against the gasoline engine, reserving a little more space for certain aspects which concern the comparison between gasoline and diesel fuel.

In support of the diesel engine are :

- its lower consumption, particularly at low loads
- its greater flexibility
- its low level of CO and HC emission
- its ability to use a wide range of motor fuels
- its development potential (direct injection and supercharging).

Against it are :

- its lower specific power output
- its greater weight
- its higher rate of smoke discharge and objectionable exhaust-gas odour
- its higher noise level
- another factor is its higher cost which is substantially due to
  - its injection system, dearer than a carburettor
  - a heavier engine, more sophisticated metallurgical techniques and tighter tolerances
  - its more complicated cooling system
  - its more powerful batteries and starter motors
  - its more thorough sound-deadening.

Let us now turn from the engine to its fuel. Table 15 shows the energy consumptions at the refinery in order to produce one kilogram of gasoline at three levels of lead content and one kilogram of diesel fuel at three levels of sulphur content and with various percentage yields in diesel fuel. The result is that up to diesel fuel yields of 35-40%, its energy "cost" is far lower than that of gasoline, even at the lowest sulphur contents. Only where a diesel-fuel yield of over 40% must be obtained without the least sacrifice of quality would the difference be smaller, but it would still be sufficiently important to constitute one of the main factors that make the difference between actual energy consumption of the gasoline engine and of the diesel engine.

Table 15 - ACTUAL ENERGY CONTENT (NET CALORIFIC VALUE (n.c.v.) + INTERNAL CONSUMPTION (i.c.) AT THE REFINERY) PER UNIT WEIGHT AND VOLUME OF GASOLINE AND DIESEL FUEL

Facility			Net calorific value (n.c.v.) (kcal/kg)	Net calorific value (n.c.v.) (kcal/litre)	Internal consumption (i.c.) (kcal/kg)	Internal consumption (i.c.) (kcal/litre)	I.C./N.C.V. x100 (%)	Actual energy consumption (n.c.v. + i.c.) (kcal/kg)	Actual energy consumption (n.c.v. + i.c.) (kcal/litre)
					GASOLINE				
	RON	Pb g/litre							
Refinery representative of the average found in Europe	98	0.6	10320	7637	1783	1319	17.3	12103	8956
	98	0.4	10253	7659	2013	1504	19.6	12266	9163
	(*)98	0.15	10213	7741	2517	1908	24.6	12730	9649
					DIESEL FUEL				
	Yield on the crude%	Sulphur (%)							
Topping	30	0.5	10276	8529	350	291	3.4	10626	8820
Topping + desulphurization	30	0.05	10330	8481	710	583	6.9	11040	9064
Extended topping removal of diesel/heating oil	40	0.5	10276	8529	380	315	3.7	10656	8844
Topping + hydro-cracking	50	0.3	10304	8490	1250	1030	12.1	11554	9520
Topping + desulphurization + hydro-cracking	50	0.05	10334	8464	1466	1201	14.2	11800	9665

(*) At this level of lead content, new investments would be necessary to produce RON 98 gasoline.

4.2.4.2. Other engines

On the subject of replacing today's internal combustion engines by engines of new or old concept (e.g., the steam engine) which can with our new technologies become practicable from the energy standpoint, there is discussion throughout the world and much has been written on it. This report can necessarily only give a quick run-down on current trends and the possibilities of short-term development of such engines.

The engine types, other than the present gasoline and diesel ones, which are now being considered for propulsion purposes include :

- stratified charge with main combustion chamber or with main and auxiliary combustion chambers
- Brayton cycle
- Rankine
- Stirling
- electric.

The electric motor will be discussed later, but a comparison can be made of the overall thermal efficiencies of the different types of engines mentioned, against the mean and maximum values for Otto cycle engines and the mean value for diesel engines. For this comparison, see Figure 3 (2).

Table 16 shows the efficiencies of these engines in relation to the mean and maximum values for the conventional gasoline engine and the high-speed diesel engine. Studies throughout the world support the view that the Stirling engine's efficiency can be improved by some 55%, the gas turbine by 11% and the reciprocating steam engine by 24 % over the conventional reciprocating Otto cycle engine, but at present we are still at the levels given in the table just mentioned. It can be observed that the engine with the highest efficiency (the Stirling) has the same overall efficiency as a good Otto cycle engine, whilst it is 22.7% less efficient than a good indirect-injection diesel engine. We cannot expect large changes in the efficiency of these engines in the next few years and in any event it will be difficult for them to cover a substantial proportion of the motor vehicle population.

Stratified charge engines are now a very small percentage of the international market; they have a reasonable efficiency and comply well with the anti-pollution laws.

Table 16 - PERCENTAGE VARIATIONS IN THE EFFICIENCIES OF VARIOUS ENGINES FROM THOSE OF OTTO CYCLE ENGINES AND DIESEL ENGINES

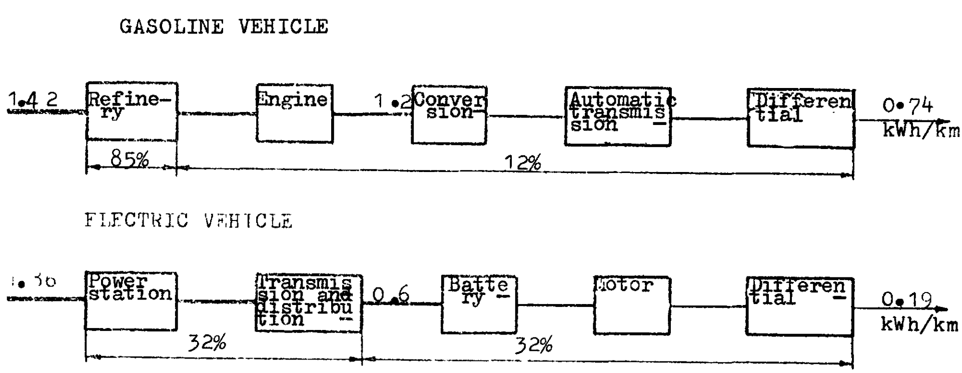
Engine type	Percentage variation in efficiency from :		
	Mean value, Otto cycle engine	Maximum value, Otto cycle engine	Indirect injection diesel engine
Stratified charge with auxiliary combustion chamber	- 13.0	- 38.5	- 51.2
Stratified charge (Texaco)	- 8.51	- 29.2	- 43.9
Stratified charge (Ford)	22.9	- 13.1	- 31.1
Brayton	8.7	- 27.1	- 39.0
Rankine	13.0	- 20.0	- 36.6
Stirling	34.8	- 4.6	- 24.4

There is a great interest, again from the point of view of energy, in some studies on new types of stratified charge engines that, among the unconventional engines mentioned, seem to be those with the greatest likelihood of penetrating the motor vehicle market in the time span considered in this report.

In comparison with other types of engines, the electric motor gives very high efficiencies but, on account of the losses due to charging and discharging the batteries and to the control gear, together with the considerable extra weight added by the batteries, a vehicle equipped with such a motor has no advantages from the energy point of view. Figure 15 (15) shows the energy flow (kWh/km) for two vehicles of equal range being used in town in accordance with the FDC cycle, the first equipped with a conventional Otto cycle engine and the second with an electric motor. The electric vehicle consumes more energy than its gasoline counterpart because owing to its extra weight it expends more energy in starting and accelerating. As can be observed from an overall energy balance sheet, the electric vehicle needs 1.86 kWh/km

against the 1.42 kWh/km of its gasoline counterpart. The electric motor vehicle may become attractive from the energy point of view if ever the weight of the batteries can be at least halved. The electric vehicle may win some popularity for town use, where the average daily run is not long and the motor therefore does not need large batteries; in any case these can be recharged during the night. In addition, this type of motor does not have the gasoline engine's disadvantages of a cold start and higher consumption when cold.
A General Motors study (16) reveals that, in the case of a private motor vehicle with a gasoline engine which consumes on average 10 litres per 100 km of urban driving when at working temperature, over a distance of 8 km with an engine temperature of 21°C the consumption rises to 12.5 litres per 100 km and up to 15.9 litres per 100 km on a cold day; logically, such consumptions go up further with shorter runs. In contrast, the energy consumptions of electric motors are very little affected by either temperature or distance and render this type of motor appropriate for town use.

FIG.15 - ENERGY FLOWS AND EFFICIENCIES OF A CONVENTIONAL MOTOR VEHICLE AND AN ELECTRIC MOTOR VEHICLE WHEN BEING DRIVEN IN TOWN (FDC cycle)



The figures above the arrowed lines show the energy (kWh/km) being expended.

The figures given in percentages are the efficiencies of conversion.

5. SYNTHETIC MOTOR FUELS

This means those products, to be used in their pure state or in a mixture with gasoline, which are derivable from sources other than crude oil.

Among the numerous substances proposed in recent times, the most important would appear to be hydrogen among the gases and alcohols and ethers among the liquids.

Hydrogen is very promising from the standpoint of both energy and ecology, but does not seem likely to be available on a large scale at reasonable prices in the short or medium term.

Synthetic liquids, to be used mainly in mixture with hydrocarbons, can be viewed in two ways :

- as simple substitutes for a proportion of gasoline (10-20%), i.e., a proportion of energy deriving from crude oil is replaced by a like proportion produced from a different source (a problem of economic policy rather than of energy);
- as high-octane ingredients which, at the same time as they replace a proportion of the gasoline, bring about a saving of energy on the production of the base substance itself; for, given equal finished-product characteristics, the hydrocarbon base substance can have a lower octane number and therefore a lower overall energy content (lower consumptions).

Let us look at some of these substances :

5.1. Methanol

This is manufactured from synthesis gas (CO and H_2) which can, in its turn, be made from various sources, the most important of which are natural gas and coal.

The production of methanol would appear, in an energy context, suitable as the means of conveying otherwise unusable primary energy.

When used at the rate of 10-15% with gasoline it significantly raises the octane number of the hydrocarbon base substance so that, even without any lead present, it is feasible to produce gasolines at the 98-99 RON level from a 91-92 RON base.

In practice, however, the use of methanol/gasoline blends gives rise to certain disadvantages such as poor solubility in contact with water and at low temperature, difficulty in starting the engine when cold owing to the high latent heat of evaporation of the alcohol, and excessive volatility owing to the formation of azeotropes.

It is nevertheless thought that all these problems can be solved or at least partially offset by making appropriate changes at the refining stage and on the motor vehicle.

5.2. Ethanol

This has important short and medium term prospects because it can be synthesized from numerous substances containing sugars, starches and cellulose by exorthermic fermenting processes.

Research on improving the ethanol production processes is very much a topic of considerable interest.

Ethanol, like methanol, possesses high antiknock properties and poses, although to a much less extent, the same operative problems.

5.3. Ethers

These are more promising substances, to be used mixed with gasoline, in particular di-isopropyl ether and methyl tertiary butyl ether which, as well as possessing high antiknock properties like the alcohols, do not pose the problems of miscibility, azeotropism or the excessive cooling effect associated with alcohols.

Ethers also have the great advantage of being usable without any necessity of altering the cycles at the refinery and, more particularly, of altering the engine of current private motor vehicles.

They could therefore provide an attractive solution, even in the very short term.

6. CONSTRUCTION MATERIALS

This is again so vast a topic that to deal with it properly would require saveral volumes crammed with statistics, commentaries and calculations.

It is by and large outside the fields of knowledge of your reporter and it is far too big to be covered in the time available. Consequently we have confined ourselves to treating, extremely concisely, only two aspects of the problem :

1) reduction in the actual consumption of motor fuel resulting from the use of lighter materials ;
2) advantages of recycling the materials now most commonly used.

6.1. Use of light-weight materials

Before embarking on a discussion of this subject, it would be worth while seeing the average life expectancies of European private motor vehicles (Table 17) (1). It follows that the effect of any innovation in private motor vehicles should, as we have already mentioned, be regarded as planned for the medium term.

Energy required for construction - On average, it can be assumed that, in respect of complete construction from the extraction and refining of the raw materials up to the final assembly operations, the energy cost is about 2.05 metric tons of crude oil per metric ton of motor vehicle (17). In other words, building a private motor vehicle consumes as much energy as would be required to run the same vehicle a distance of 20,000 km.

In order to reduce consumption,action could be taken to reduce the weight :

a) by using thinner steel plates; at present, however, the plates are so thin that a further reduction would give rise to serious safety and longevity problems;
b) by using aluminium alloys. The results are shown of a study on the use of such alloys in the construction of private motor vehicles, based on the circumstances in Italy. An extrapolation to reflect the position in the Community can be made by using the statistical data available. In the case of Italian private vehicles today, approximately 56% (12) of their weight consists of ferrous materials which could be replaced by aluminium alloys. Table 18 gives particulars of the private motor vehicles in use in 1973, classified by cylinder capacity and weight,whilst Table 19 shows the amounts of energy required to produce one metric ton of semi-finished steel, first-melt aluminium and recycled aluminium (70% of first-melt aluminium and 30% from recycling).

The successive calculations are based on these assumptions :

- 56% of the weight of a private motor vehicle is contributed by ferrous materials which can be replaced by aluminium alloys; thus taking, for simplicity's sake, a private motor vehicle with a weight of 1000 kg, 560 kg of ferrous materials are replaced by 260 kg of aluminium alloys, bringing down the weight of the vehicle to 700 kg (a 30% saving).
- In 11 years(the average lifetime of a private vehicle) from the innovation, today's vehicles would be totally replaced by vehicles of light aluminium alloy and, from that time on, new vehicles would be produced by recycling the materials at 70% efficiency.

The 30% saving in weight would be echoed by a 21% saving on the in-town consumption and 2% saving on the out-of-town consumption.

After the total replacement of vehicles now in use, the consumptions will be as shown in Table 20.

The overall saving in the final situation would be 14.2%, and during the 11 replacement years the saving would rise by about 1.3% per year.

Against this saving, however, we have to set the higher energy cost to manufacture the new vehicles (18).

Let

P_f be the weight of ferrous materials contained in 1 metric ton of motor vehicle

P_a be the weight of the aluminium alloys replacing the ferrous materials contained in 1 metric ton of motor vehicle

E_f be the energy consumption for the production of 1 metric ton of ferrous materials

E_{a1} be the energy consumption for the production of 1 metric ton of first-melt aluminium

E_{a2} be the energy consumption for the production of 1 metric ton of aluminium recycled from scrap

then :

- the energy difference (D_1) in the production of 1 metric ton of new motor vehicles by using first-melt aluminium will be given by :

$D_1=(P_f.E_f) - (P_a.E_{a1})= -10,310$ kWh/t=$\sim$-.887 t.o.e./t (deficit)

Table 17 - AVERAGE LIFE EXPECTANCY (YEARS) OF PRIVATE MOTOR VEHICLES IN THE EUROPEAN COMMUNITY COUNTRIES

Country	1969	1970	1971	1972	1973
Italy	13.3	13.3	14.3	15.5	14.3
France	11.8	12.7	12.2	12.2	11.4
Germany	11.3	10.9	10.6	10.0	11.2
Belgium	8.3	9.4	9.8	8.3	8.3
Netherlands	9.4	9.3	10.0	9.3	11.0
Denmark	12.5	12.7	14.5	14.5	12.9
Ireland	10.2	9.3	9.3	9.3	9.3
United Kingdom	15.5	11.9	11.0	11.3	11.8

Table 18 - WEIGHT AND CYLINDER CAPACITY OF THE PRIVATE MOTOR VEHICLES IN USE IN ITALY IN 1973

Cylinder capacity(cm^3)	Unit weight (metric ton)	Number in use (10^3)	Total weight (10^3 metric tons)
800	0.6	4780	2.838
800 ÷ 1000	0.7	2990	2.093
1000 ÷ 1500	0.8	4578	3.663
1500 ÷ 2000	1.0	909	0.909
> 2000	1.2	166	0.199
Total			9.732

Table 19 - ENERGY COSTS OF CERTAIN MATERIALS

Material	Energy production cost (kWh/metric ton)
Semi-finished steel	14900
First-melt aluminium	73440
Second-melt aluminium (70% alloy with 1st melt Al.)	29070

Table 20 - ANNUAL CONSUMPTIONS OF GASOLINE TODAY AND AFTER PRESENT TYPES HAVE BEEN REPLACED BY PRIVATE MOTOR VEHICLES OF ALUMINIUM

Circumstances	In-town consumption (10^3 metric ton)	Out-of-town consumption (10^3 metric ton)	Total consumption (10^3 metric ton)
Present	7102.2	3875.3	10983
Post-replacement	5629.8	3797.2	9427
Saving			1556 (14.2%)

- The energy difference (D_2) in the production of 1 metric ton of new motor vehicles by using aluminium recycled from scrap will be given by

  $D_2=(P_f.E_f) - (P_a.E_{a2}) = 941.9$ kWh/t = $\sim$.0081 t.o.e./t(gain)

Assuming complete interchangeability of the gasoline saved and the fuel oil expended in production, the overall annual savings shown in Figure 16 are obtained.

<u>Conclusions regarding the replacement of ferrous materials by light aluminium alloys</u> - Assuming that private motor vehicles are built in which all the ferrous materials are replaced by aluminium, the consequences will be the following :

- The energy cost of vehicle construction increases considerably over present values; overall in the initial years the energy demand increases rather than decreases.
- It is only after 14 years from the time of beginning to produce motor vehicles of aluminium that the energy balance will be redressed, provided always that after complete replacement of vehicles now in use, i.e., after 11 years, it is possible to recycle 70% of the aluminium employed.

- When conditions have stabilized (after 11 years), this operation will save 14% of the gasoline currently consumed, but at very high capital expenditure and risk.
- To this is added the fact that it is necessary to set up an aluminium refining industry which in 11 years' time will have to work at 30% of its productive capacities.

This kind of exercise is only therefore valid in the long term and must above all be delayed until aluminium no longer makes such inroads on oil.

6.2. Recycling of scrap

As Table 21 [17] shows, there are certain materials (aluminium, zinc) where complete recycling can bring about energy savings of as much as 80%. Steel does not offer this bonanza as the saving made in passing from first-melt to second-melt material is only about 50%.

Remembering that ferrous materials account for 56% of the weight of a private motor vehicle and about 33% of the energy expended in its construction,and supposing that first-melt semi-finished steel is replaced gradually by recycled steel, it is possible to arrive at the situation set out in Table 22. It will be observed from this table that when first-melt ferrous materials are replaced entirely by recycled materials, it is possible to effect an energy saving of about 17%.

In the current situation where the engine and the transmission are removed from the scrapped motor vehicle and the bodywork is baled hydraulically, the furnace charge may not contain more than 15% of recycle material owing to the high level of impurities in the bodywork, i.e., the material used to produce 1 metric ton of steel cannot contain more than 20% of recycle material [17]. Were it possible to arrive at a situation where recycle material makes up 80% of the finished steel, not only would there be an energy saving of some 11% but above all there would be a larger and better utilization of the ferrous materials. The arguments which can be drawn from this brief analysis of the effects that the choice of materials has on energy consumption would mainly appear to be the following :

FIG. 16 - USE OF ALUMINIUM ALLOYS

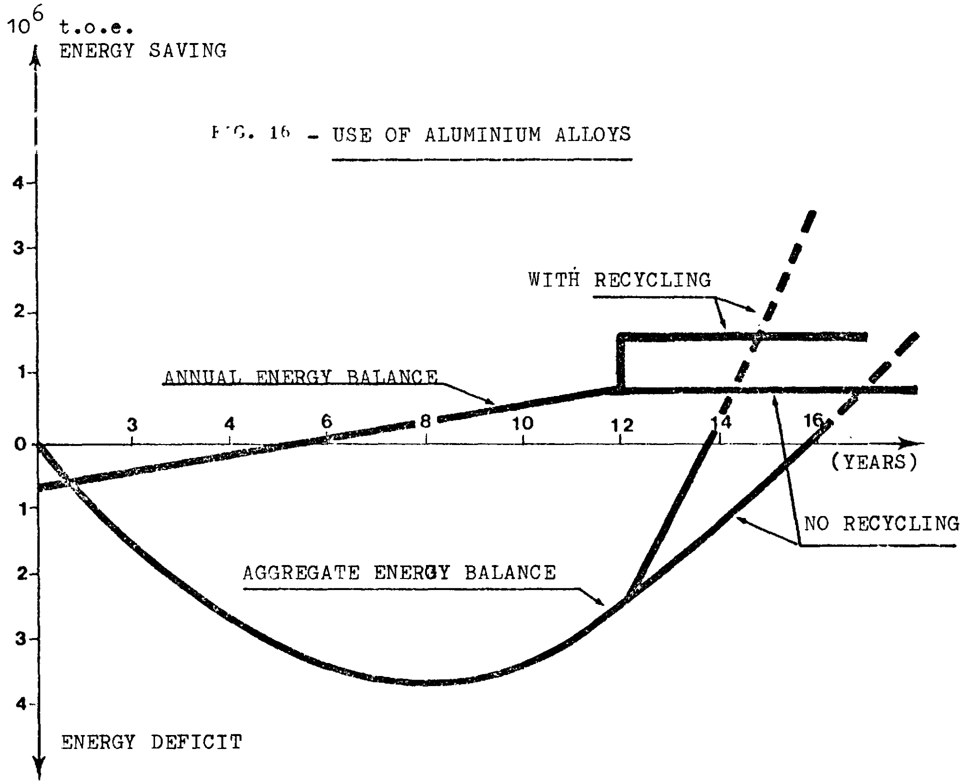


Table 21 - ENERGY COSTS OF VARIOUS FIRST-MELT AND SECOND-MELT MATERIALS

Material	Production energy cost (kWh/metric ton)		Percentage energy saving
	First melt	Second melt	
Semi-finished steel	14900	7040	52.7
Aluminium	73440	10054	86.3
Copper	37500	15375	59.0
Zinc	23225	5385	76.8

Table 22 - ENERGY SAVING WITH THE RECYCLING OF SEMI-FINISHED STEEL

Material percentage		Energy cost for 1 metric ton of motor vehicle (kWh)	Percentage saving on the no-recycle situation
First melt	Recycle		
100	0	25625	0
80	20	24744	3.4
60	40	23864	6.9
40	60	22984	10.3
20	80	22104	13.7
0	100	21223	17.2

(a) The replacement of steel by light materials (aluminium has many practical disadvantages and would in any case only become effective in the medium term.

(b) Instead, it would seem much more sensible to try to produce motor vehicle bodywork already pre-arranged at the design stage for more intensive recycling, by making it easier to remove the non-ferrous materials that foul the blast furnace charge.

7. COMMENTS AND CONCLUSIONS

The first conclusion to be drawn from the foregoing analysis of the problem of energy consumption by motor vehicles is that it is technically feasible to reduce the consumption by a large margin.

The second is that the factors needing action taken on them are numerous and inter-related and therefore call for overall examination of all the variables affecting consumption, especially from the viewpoint of the energy costs of the motor fuels and construction materials.

The third is that, whilst factors depending on the user could have an immediate effect, those depending on the vehicle design can only yield tangible results in the medium term.

It is these facts that make it extremely difficult for the Community to identify the courses of action that will cope with the problem as a whole, but at the same time they underline the urgent need for action. Some specific suggestions will certainly emerge from the discussion following the presentation of this paper. To stimulate debate, here are a few possible topics :

1) Propaganda campaigns aimed at the motorist.
2) Coordination of the taxation systems covering motor vehicles and motor fuels in the member countries.
3) Examination of the applicability of a specific body of laws following the example set by the USA.
4) Examination of the effects on consumption arising from the Standards relating to safety, exhaust emissions and the lead content of gasolines.
5) Incentives to manufacturers to produce more economical motor vehicles.
6) Support for the necessary research, to be done by the industrial firms and the authorities concerned on a cooperative and interdisciplinary basis, in order to tackle the various aspects of the problem in a practical manner.

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DISCUSSION BY THE PANEL

Intervention of Mr. Sullivan

I must first of all say that while I am listed in the documents as a representative of Government the views I express are my own : nevertheless I think I should make some attempt to reflect broadly a Government point of view in so far as the objectives and aims of this conference are concerned.

A summary of these aims is contained in the invitation brochure where it states that the conference is to lay the foundation of a programme for the drawing up of new regulations on motor vehicles which takes account of the economic, financial and social requirements of both users and manufacturers and incorporates a cost-benefit ratio acceptable to society.

Let us consider for a moment the following provocative but hypothetical situation. Government X decides unilaterally that for energy and balance of payments reasons it will only permit motor vehicles to be sold and used that meet the following criteria :

(1) Long life vehicles which are easily tuneable, readily repairable and which at the end of their life lend themselves to recycling.

(2) Vehicles which meet predetermined fuel consumption under specified driving cycles.

(3) Vehicles which meet certain national minimum safety standards - relaxed from present EEC proposals.

(4) Vehicles which meet certain national minimum noise and air pollution standards - relaxed from present EEC proposals.

While it may be considered that the present process of optional harmonisation is sufficiently powerful to limit the effects of such national action it must always be remembered that Governments have many administrative mechanisms available to them (for example : taxation) which can be designed to favour vehicles which meet the desired criteria.

This process could therefore result in new barriers to trade or at least emasculation of the present process of type approval.

The above provocative but hypothetical example has been raised not only to point out to you the undesirability of such unilateral national action but also to put before you the vehicle construction features that at first sight should be the aim of all Governments. I have used the words "at first sight" deliberately because I am sure there are those among you who may feel for example that a long life easily repairable, easy to recycle vehicle is not the best solution but rather we should seek to encourage vehicles with short life bodies fitted to a long life diesel engine and transmission. The point is that simplistic criteria may not always yield optimum results.

In essence this symposium and in particular this session on energy and raw materials usage has pointed out the necessity to take a systems view of the problem areas. The driver and vehicle as a system has been recognised for some considerable time but the view now required must encompass a wider horizon. The system boundaries have expanded over the years so that now we have to examine the following interactive systems:

The Vehicle system as a factor in the economy of the EEC.

The Vehicle/Driver system as a factor in road safety .

The Vehicle/Driver system as a factor in pollution.

The Vehicle/Driver system as a factor in energy and raw materials usage.

The fact that these are interacting systems is self-evident - otherwise we would arrive at the foolish conclusion in this (energy and raw materials) session that we should all use motorcycles or bicycles.

It is also necessary to remember that the solutions are not all in the engineering area - the solutions like the problems are likely to form part of an interactive system. Thus for example a whole range of Government actions are possible in the energy conservation area varying from rationing of petrol to tax policies or speed limits designed to achieve similar results.

Such Government policies interact with the engineering solutions, for example, it has already been pointed out by one speaker at this symposium that if all EEC countries make the wearing of seat belts mandatory then the cost benefit ratios for passenger car occupant protection measures will alter substantially. It would therefore appear desirable in this instance at least that "Use of Vehicles Regulations" should advance hand in hand with legislation dealing with vehicle construction.

Given the complexity of the problem areas and the variety of interacting solutions, it seems that optimum solutions are only likely to be perceived after detailed evaluations by highly competent interdisciplinary teams backed by resources of Industry, Government and Universities. Unilateral action by National Governments or indeed action by the Commission without such detailed evaluations is unlikely to yield the best results. However, it must be realised that Governments may well see the problem as so acute that they cannot await the outcome of such evaluations unless the evaluative process is seen to be dynamic. The necessary evaluative process is progressing at the level of Geneva (under Working Party 29) and also here in Brussels under the Energy and Motor Vehicle Programmes and of course in the U.S.A. and U.S.S.R. Nonetheless the work is fragmented and is not specifically tailored to the objective of achieving safe transport at tolerable levels of energy and raw materials usage, consonant with acceptable levels of pollution and considered over the whole life cycle of the"European Vehicle".

In these circumstances the question arises whether all the evaluations required are likely to be forthcoming from the work being done elsewhere. It has already been indicated that the solutions are likely to be multi-faced and will have to be enacted by National Governments in their Vehicle Construction, Vehicle Use, Vehicle Tax and other Vehicle Regulations - in these circumstances it is unlikely that all the answers will be found without the use of our own resources. We must of course draw on the information available elsewhere and work must not be duplicated unnecessarily.

The Commission is structuring this meeting as a symposium rather than a decision taking conference and have thereby freed participants from one important constraint - within the framework of this freedom is a requirement to suggest some practical steps to deal with the problems of the next decade and even beyond - the following suggestions are offered in this context.

The process of optional harmonisation lends itself to the unilateral national action suggested - possibly therefore a "way to go" is to introduce a form of a total harmonization of national laws. These laws would then be extended and rationalised and ultimately embrace the "European Vehicle" which would be designed to meet agreed objectives relating to safety, pollution, energy and material use considered over the whole life cycle of the vehicle.

A change from the original concept of harmonization has in any event already partly occurred - a recent EEC information bulletin (84/75) states :

"These (impediments to trade) reasons alone would justify harmonization, but they have become of secondary, even minimal, importance compared with the new objectives. Hermonization has come to assume a much broader scope and meaning. Today, the purpose and point of the "European Standards" is to improve road safety, to contribute to the conservation of the natural environment, and to protect the citizens of Europe against noise and disturbance. It is hardly an exaggeration to say that the European Commission's activity in the automobile sector represents today a major European initiative in the broad field of improving the quality of life".

If this view is to be followed to its logical conclusion then total harmonization of national laws relating to Vehicle Construction and Use seems desirable if not essential.

It may however still be possible to go forward under the system of optional harmonization but it will be essential to develop motor vehicle directives relating to a whole life view of the vehicle as to safety, pollution, energy and raw materials usage, "tuneability" maintenance, and also capacity to recycle. These new directives will be required not only to harmonize trading conditions but also to meet the safety, energy and raw materials objectives of the Community.

Under either of these possibilities i.e. total or optional harmonization the detailed evaluations noted already have to be made - a variety of solutions exist here. For example it should be possible to set up an interdisciplinary team within the Commission whose function it would be to examine into the strategies that would best achieve the desired objectives of safety, energy and raw materials usage having regard to the "whole life view of the vehicle" - the work of this group could be steered by a specialist working group at Commission level similar to "Sub Group C" already operating.

From what has been said at this Conference it is clear that considerations of the vehicle from energy, materials, and recycle points of view conflict with other aspects such as safety and pollution requirements : these factors are in fact interactive. The inference is that even directives already made or proposed in the safety and pollution field will need modification. The process of "Technical Adaptation" lends itself to this extremely well. It would therefore be a function of the proposed interdisciplinary group to examine existing and proposed directives to see how they should be modified in the context of this whole life view of the vehicle.

The Commission in proposing new directives or in adapting old ones would obviously have regard to the findings and reports of this interdisciplinary group.

The work of this group could be supplemented by modifying the present Experimental Safety Vehicle (ESV) Programme so as to produce a motor vehicle design which in the opinion of Industry meets tolerable levels with regard to safety, pollution, energy and materials use when taken over the whole life of the vehicle. Draft motor vehicle directives for optional or total harmonization would then be developed based on the findings from such a modified ESV programme.

It may be argued that the solutions suggested are too radical and not necessary - I can only say that the solutions proposed are based on a personal conviction that we are all faced with a serious problem requiring the application of large resources on an on-going basis to arrive at a correct answer. Such resources exist but in a fragmented fashion - ways and means must be found to allow the effective application of these resources to the problems raised at this conference.

I hope you find the suggestions helpful if only as a catalyst.

INTERVENTION

of Mr. KELLER

I would like to begin by coming back to the title of today's session which refers to the rational use of energy; in fact the word "rational" is meaningless unless we define the criteria and objectives we are seeking. There are, in my opinion, two kinds, first, the overall reduction of consumption for environmental reasons, the balance of payments, the cost of energy, security of supply, notably in reducing our energy dependence on overseas sources. These objectives then are considerably different and everyone attributes a greater or lesser degree of importance to each of them. I feel that the principal interest in Mr. Senzi's report lies in the rather detailed analysis of the various ways of reducing energy consumption in the automotive sector and I believe that, at this level we must attempt to take a more global approach and to examine these problems of economy and energy in greater conformity with the other sectors. In France an office for energy saving has been set up to do that; it has to take on the role of coordinating various actions and determining the criteria on which the efforts made by the Community to save energy should be based. The different methods should then be worked out and compared with other possible forms of economy. I think that the main interest of this document lies in its having drawn attention to the necessity of informing and increasing the awareness of the consumer; since, ultimately, it is normal that car designers try to please the consumer, and if the latter is particularly keen to buy cars with high fuel consumption, I do not think that we will reach our objectives.

Intervention of Mr. MONTABONE

The rapporteur, in my opinion, has the considerable merit of having had the courage, in the face of such a vast subject, to devote very little space to the problems of all materials, and to focus his attention on only one of them: oil, the motive component of transportation. He has described to us the fundamental unsolved problems of the energy policy in the transport field; and for this he deserves credit and acknowledgement.

The rapporteur dealt with the subject extensively and I will therefore submit only a few secondary remarks.

As regards regulations, the technical content of the proposal for a set of Community standards to control energy consumption in the transport sector seems to me fairly poor. I think that the problem of genuine energy savings in the transport sector should be considered in the medium and long terms, laying down as a prime requirement the respect of the principle that mobility must not be reduced, but should even be increased in the forthcoming years (I am not discussing the system or systems of transport which will be used). Consequently the requisite measures will have to be more energetic than those suggested. In my opinion, without going as far as defining a standard vehicle for town use and a second standard vehicle for urban traffic, it is necessary in the short term to see whether on the basis of precise tests and research, it would be advisable to establish performance values, i.e. maximum speeds and accelerations, for the large majority of vehicles (I exclude sports cars because they are few in number and because they must continue to represent the true image of the motor-car); these values should probably be established for two types of use - in town and out of town - these two curves possibly representing the limits of a range within which the performances of all vehicles should be included.

I will now move on to the energy question, and begin with a word of appreciation of the speaker for having at last revealed the secrets of the energy consumed by a refinery to produce one kilogramme of petrol or fuel oil and for having indicated that modern refinery techniques already hold the solution to minimum energy consumption.
The figures quoted by the rapporteur could at first sight give rise to enthusiasm, but are fairly disappointing under closer scrutiny.
Table 5 in Mr. Sezzi's report, shown here, provides some interesting data :

TABLE 5 (a)

Energy consumption in 1973	European Community	
	Total energy	Oil energy
Total energy	100	-
Oil energy	61	100
Energy for transport	12,3	20,1
Energy for motor vehicles	7,2	11,8
Energy for other road transport	3,2	5,3
Energy for other transport	1,9	3,0

In 1973 transport in Europe consumed barely 12.3% of total energy, and the motor car only 7%. Oil represented 61% of total energy but the proportion used for transport was only 20%, of which the motor car accounted for only 12%.

Thus, both in terms of total energy and in terms of energy derived from oil, transport absorbed a minimal quantity and, obviously, this situation remained virtually unchanged in 1975.
These figures lead us to repeat once again, and I think this needs to be said very clearly, that oil policy in Europe has been geared to industry and heating, and not to transport. It has been a useful policy from the point of view of the economy though not of energy, but there must be no accusations today against the car industry for creating formidable energy problems for the Community.

This is clearly confirmed by Table 5(b) which illustrates consumption in the United States.

TABLE 5 (b)

Energy consumption in 1973	United States	
	Total Energy	Oil energy
Total energy	100	-
Oil energy	45	100
Energy in transport	22,5	50
Energy in motor cars	13,3	29,5
Energy in other road transport	4,1	9,2
Energy in other transport	5,1	11,3

In the United States, transport consumed 22,5% of total energy, and the motor car 13.3%. Furthermore, the proportion of oil represented barely 45% of the total, but out of this proportion as much as 50% went to transport. This is an oil policy really geared to transport.
I think it is also relevant to refer to Table 6, which illustrates Europe's refining policy in 1973 :

TABLE 6

Energy consumed in oil	Consumption	
	10^6t	%
LPG	11,3	1,9
Gasoline	72,9	12,3
Crude naphta	30,2	5,1
Kerosene) Gasoil) Fuel oil)	387,9	68,6
Other	33,2	5,6
Refinery consumption	38,5	6,5
	593,0	100,0

This table shows that, if total consumption of crude is put at 100, gasoline accounts for 12.3%, crude naphta 5.1% and kerosene, gasoil and fuel oil together for 68.6%.

Now, what hypothesis of gasoline economy does the rapporteur present us with?

He says, on the basis of a study which I regard as approximate and probably conducted on a very restricted vehicle population, that :

(a) the most economical gasoline from the energy point of view is the present day super 98 RM grade, with 0.6 of lead;

(b) using super 98 RM gasoline with 0.4 lead, consumption increases by about 1%;

(c) using super 98 RM gasoline with 0.15 of lead, consumption increases by 7%;

(d) using 91 RM gasoline with an average value of 0.4 of lead, consumption increase by 5%.

Now, what is the breakdown between super and normal grades in Europe ?

It is as follows :

	Consumption in 1974 10^6 litres		Percent	
	Super	Normal	Super	Normal
Italy	9.130	1.140	89	11
France	16.900	4.000	81	19
Germany	14.000	10.000	58	42
TOTAL	40.030	15.140	72	28

If it were possible all of a sudden for the entire Community to use only the super gasoline recommended by the speaker, we should obtain an improvement in consumption of about 1.4%.
Bearing in mind the proportion of oil consumption accounted for by gasoline, the saving in crude would be 0.17% and in total energy about 0.10%

And this is the best contribution that manufacturers and oil producers can offer, and in doing so are already making a not inconsiderable effort.
But let us now consider some more advanced hypothesis.
We are all convinced, or better, we are seeking to convince the car industry that within 5-6 years it will be possible to reduce total energy consumption (traffic and refineries) by 30-40%. Let us say that this hypothesis is a foregone conclusion.

Let us also assume that petrol engines will continue to be used and that refinery policy will remain unchanged and the same as at the present time. According to table 6, the gasoline requirement will fall suddenly from 72.9 10^6 tonnes to 43.7 10^6 tonnes and then production of crude naphta will fall from 30.2 to 19.12 10^6 tonnes; the kerosene/gasoil/fuel-oil complex will fall from 387 to 233.06 10^6 tonnes; consumption of crude from 593 to 355.8 10^6 tonnes.

A magnificent saving of crude, but where will industry, the petrochemicals sector and heating go to obtain the missing tonnes, i.e. as much as 40% of what is now used ?

Here are two solutions, one possible, the other doubtful :

<u>First solution</u> :

Refining stays unchanged. It continues to import the same quantity of crude and will make available in the form of gasoline, an oil surplus of 4.92% which (as a proportion of the total energy, represents as usual a surplus of 2.90%. How to use this will be a problem. Therefore, we conclude it will be wasted.
If, in the final analysis, it will be possible for all the surplus gasoline to be consumed in industry and heating, while maintaining total requirements unchanged, there will have been an oil saving of the order of 6-7%.

Second solution

Refining reduces its output to 8% of gasoline, and transfers the difference into gasoil and fuel oil. According to this hypothesis, the energy balance of industry would be safe and energy consumption would be reduced by about 8%.

Now the question arises : is it fair and honest to require such a great sacrifice from the motor industry : 40% less energy consumption in order to achieve only an 8% saving in crude and a total saving of 5% ?

But let us make another more audacious assumption. The reduction in energy consumption is still 40% but now the refineries adopt the American principle and produce about 30% of gasoline.

The pattern of refining may be broken down as in the following table :

	%	10^6 tonnes
LPG	1,9	2,80
Gasoline	30	43,70
Crude naphta	5	7,30
Gasoil)	51,0	74,50
Kerosene)		
Other	5,6	8,20
Refinery consumption	6,5	9,70
TOTAL	100,0	146,00

The table shows consumptions of crude and energy forms available, on the hypothesis that the policy will be base solely on transport requirements. Imported oil would fall in Europe by 75% but the shortfall in industry would be enormous (81%). In my opinion, these figures should make us think about the energy sources we should choose for the future.

When drawing up energy balance sheets and making comparisons between the various sources of energy, using conventional or other engines, there is an extremely important fact to be borne in mind : balance sheets must always be drawn up for equivalent performances. The error of comparing vehicles powered by different means with different performances must be avoided; and this applies in all cases, including that of electrically powered engines.

The speaker illustrated the influence of performance with an example, but since I do not know whether his example is theorical or real, and since people say all manner of things about the use of diesel fuel in motor vehicles, I think it is important to supply some experimental data obtained last year in a European laboratory. In this laboratory tests were carried out on three diesel vehicles currently existing on the European market and, where possible, their corresponding petrol-powered versions. Then these three vehicles were fitted with petrol engines, appropriately selected and adjusted to obtain the same torque and revolution performances as the original diesl engine.

These are the results :

TYPE OF VEHICLE	A			B			C	
Engine	Petrol	Diesel	Petrol 1	Petrol	Diesel	Petrol 2	Diesel	Petrol 3
Vehicle weight	1170	1270	1235	1550	1600	1525	1640	1543
PERFORMANCES :								
Maximum speed	133	128	128	-	137	135	136,4	136,4
1.000 from standstill	42,2	46,2	45	-	42,3	42,3	44	43
1.000 from 30 km/h	46,8	51,4	50,2		47,6	48,4	47,6	48
CONSUMPTION ON MOTORWAY In Kg/100 km :								
50 km/h	4,44	$\boxed{3,55}$	3,59	4,81	$\boxed{4,24}$	4,51	4,79	$\boxed{4,14}$
90 km/h	5,92	$\boxed{4,87}$	4,88	5,70	5,85	$\boxed{5,77}$	6,77	$\boxed{5,55}$
110 km/h	7,40	6,27	$\boxed{6,14}$	6,81	7,26	$\boxed{6,73}$	8,58	$\boxed{6,73}$
130 km/h	9,25	8,82	$\boxed{7,70}$	9,77	9,73	$\boxed{9,70}$	17,72	$\boxed{10,51}$
CONSUMPTION IN TOWN	-	8,5	$\boxed{8,2}$	-	10,3	$\boxed{10,00}$	10,84	$\boxed{10,36}$
AVERAGE SPEED	-	26,2	25,8	-	26,8	26,8	27,1	27,4

$\boxed{}$ MINIMUM CONSUMPTION VALUE.

In my opinion the figures in the table are extremely interesting. If we consider energy consumption on the basis of the tank alone, it is certainly true that the diesel version consumes less than the corresponding petrol version supplied by the firm :

- in the case of vehicle (a) 20% less is used at 50 km/h
- in the case of vehicle (b) the figure is barely 12%, but when the correct petrol engine is used, the situation is reversed; consumption by the petrol version is still below that of the diesel version. There is a difference

of -12% for the petrol engine in case (a) and as much as - 22% for vehicle (c) at high speed.

In town, the difference is less but the petrol engine consumes slightly less in all cases.

For some people this situation will come as a surprise, but I think that this laboratory may have some even more interesting data to supply.

And now, the final recommendations :

1. Comparisons of any nature in the energy field must be carried out carefully and correctly.

2. The industrial and heating sectors and this includes the electricity-generating industry, must be asked to make sacrifices balanced out among them because only in this way will the substantial sacrifice made by the transport sector be able to produce satisfactory results.

3. It is pointed out that transport naturally and necessarily requires oil in order to operate correctly; in most cases, industry does not need oil.

4. If decisions are taken to adopt an oil policy particularly geared to transport requirements, even if such a policy does not come into force before the year 2000, it must be borne in mind that oil may continue to be available for many years to come.

5. Vehicle taxation systems must be harmonized.

6. Standards relating to the determination of performances must be laid down at Community level and only at that level.

7. Regulations should be devised to curb energy consumption in the transport sector while preserving mobility.

<u>Intervention of Mr. IZARD</u>

I would like to confine my remarks to making two points and asking one question on this issue of rational use of energy in motor vehicles.

In his paper, Mr. Sezzi points out that there is still scope for improving the economy of gasoline engined vehicles e.g. Fig. 3 and Table 16 of his report. I believe that this matter has been under-emphasized not only in the short term but in the longer term too and I would therefore like to support him on this issue and refer to figure 1 which illustrates that with existing fuels considerably better use could be made of the octanes provided. This figure shows octane requirement plotted against compression ratio for over 1000 European vehicles with each point representing data from either 5 or 10 cars of the same model. It is fairly obvious that, with some vehicles, compression ratio could be raised and road economy improved without knock

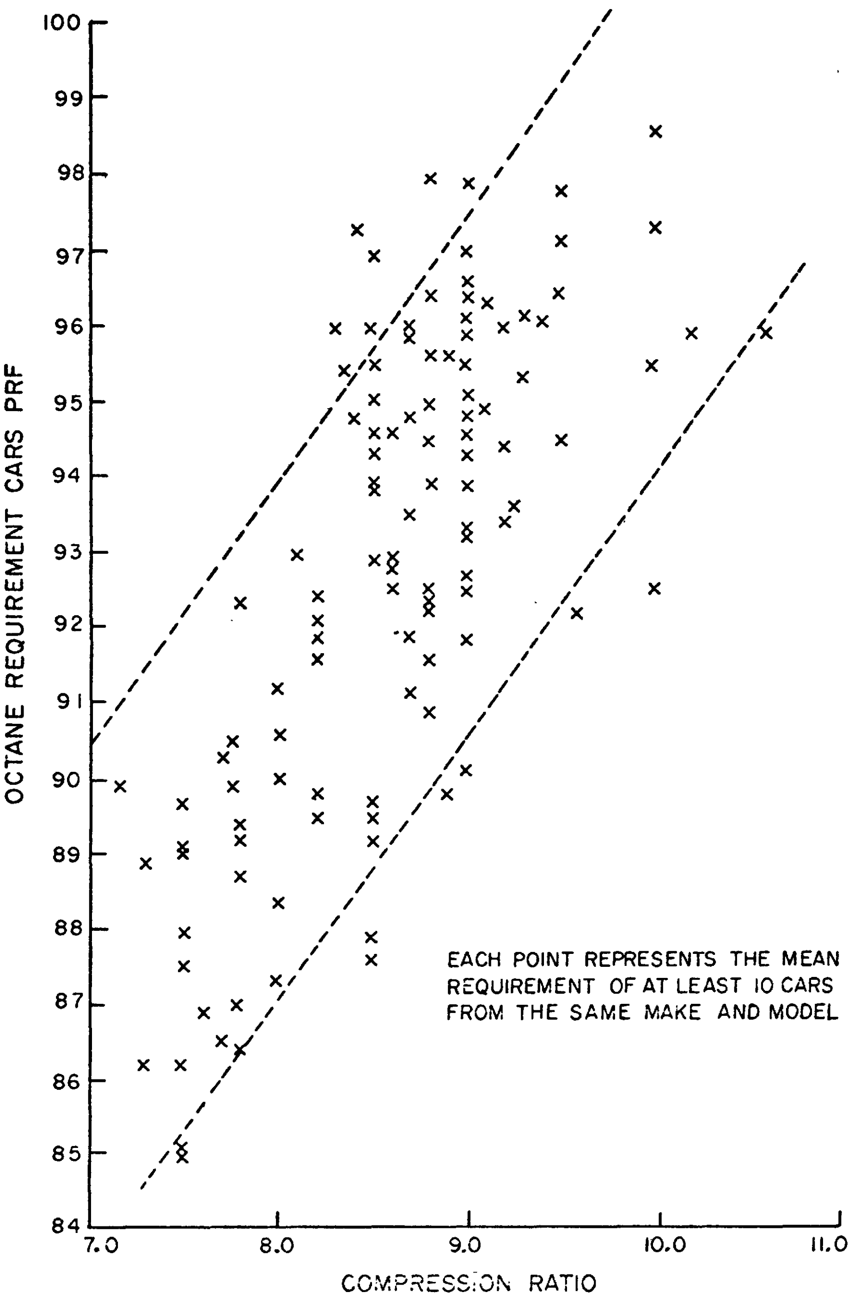

FIG. 1 — Relationship between Octane requirement and compression ratio for cars of different makes and models.

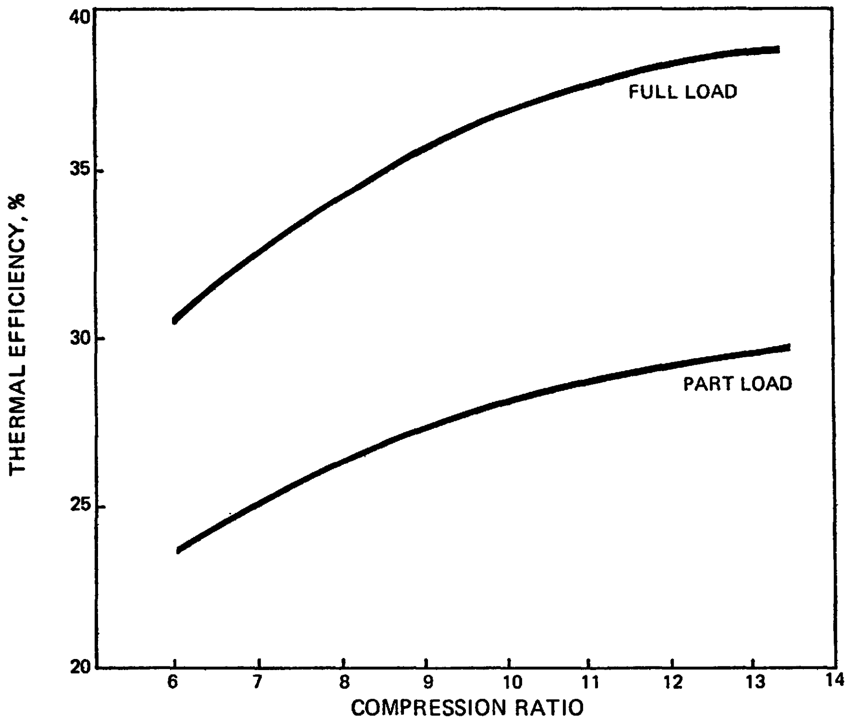

FIG. 2 – Thermal efficiency versus compression ratio

Type of driving	Inlet manifold vacuum ranges (mm – Hg)			
	0–100	101–210	211–320	321–600
E.C.E. 15 test (cold start)	4.5	5.1	21.3	69
E.C.E. 15 cycle (hot start)	0.8	0.8	9.3	89
U.S. Federal (C.V.S.) test cycle	4.6	6.3	14.1	75
Japanese II mode test cycle	2.3	10.1	17.0	70.5
Urban (city) driving	0.7	3.6	14.5	81.1
Non-urban (inter-town) driving	2.6	7.0	16.2	74.3

FIG. 3 – Percent use of ranges of inlet manifold vacuum, for a car having an engine capacity of 1800 cm³, and automatic transmission.

occurring. In other cases octane requirement could be reduced with consequent reduction of energy needed to manufacture fuels of suitable anti-knock quality.

I would now like to turn to Fig. 12, of Mr. Sezzi report which suggests that, if a motorist is prepared to sacrifice performance, then better economy can be obtained. In turn this suggests that in this case throttle opening (manifold depression) is important and I would like to refer to fig. 2. This illustrates that thermal efficiency is significantly better at wide open throttle than a part throttle. The importance of this factor can be seen in Fig. 3, which shows how little time is spent at full or 3/4 throttle in various driving cycles and how the same situation applies to a vehicle on the road in urban and open road driving conditions.

There is a challenge here - the need to improve efficiency at part throttle and to make better use of available octanes.

I would now like to ask a question. In the paper the considerable effect which vehicle weight has on fuel economy has been highlighted. Could the manufacturers please indicate the likely trend in passenger car weights over the next 5 to 10 years. This could be of importance not only in terms of fuel consumption on the road but in respect of energy demand in the manufacture of the vehicle.

I make this latter remark since about 70% of the energy consumed in constructing a car is absorbed in making the materials from which they are produced.
Reducing the weights and keeping roughly the current material balance, reduces initial energy demand.

Intervention of Mr. WEIGHELL

I intend to add little to what has already been said but rather to sum up my views of the most significant points which have been made during the symposium where these affect energy conservation.

1. Transport is a vital element in the wealth of nations. The road vehicle population and annual kilometres travelled are directly related to economic activity and national wealth because they are essential factors in generating that wealth.
   If transport is restricted or made less economic, the perceived standard of living of the people will fall.

2. Road transport is the mainstay of the transport systems of all developed nations because it is speedy and flexible.
   Rail demands a unique and expensive infrastructure and is almost always subsidised to a large extent.
   So, for many purpose there can be no alternative to road transport and it is clear to me that, whatever the fuel used, whatever the size or the ownership of the vehicles, motorised road transport for goods and people will remain the predominant travel mode in populous and wealthy nations

such as represented by the European Community.

3. Mr. Sezzi has told us that, in 1973, road transportation in the Community used 17.1% of the oil consumed. Expressed as a percentage of world oil consumption this is only 3.9%.
   The world's oil problem will not therefore be solved by saving some road transport fuel. Indeed, if the objectives of the Community programme for the Rational Use of Energy are achieved, the 35 mtoe target for transport will represent a reduction in world demand of only 0.25%. Of course such savings are significant in terms of balance of payments and economic efficiency, so they should be pursued - but other solutions to the oil problems of the world must be sought with much greater priority.

4. Liquid fuels are the most suitable fuel for portable power units such as used in road vehicles. Oil should therefore be conserved for portable power and petro chemicals, and application of this policy should begin now so as to initiate the changeover of stationary power and heating sources to alternative, non portable fuels.

5. The effects on fuel economy of advanced safety, severe noise control and the more extreme pollution controls is unquestionably adverse. Each of these features adds vehicle weight or reduces the energy conversion efficiency of the power unit in the vehicle.
   Pollution controls to the EEC 74/290 standards, lead limitation to 0.45g /litre and noise limits as proposed in the Draft EEC Directive, represent levels beyond which the adverse effects on fuel economy would not appear to be justified by the purely marginal effects of such measures on the environment.
   Safety controls may be in a different category provided that their performance in reducing deaths and injuries is really effective.
   Amongst those measures which are certainly qualified on cost/benefit grounds is the compulsory wearing of seat belts at all times, as confirmed by Dr. MacKay and referred to by Mr. Gundelach when opening this Symposium.
   The implementation costs are negligible, their effectiveness in use is proved and the application could be immediate. No additional weight, fuel penalty or cost is added to cars for front seat applications, since installation has been mandatory for some years in most Member States.
   It appears to be very widely accepted that governments should introduce this regulation immediately, to apply to driving at all times on all public roads. This beneficial move uses no additional fuel, but it is likely to achieve a greater reduction in deaths and injuries than any other measure under review.
   Fuel economy and cost effective safety measures are matters of survival, while pollution and noise are rather matters of comfort. Survival must be more important than comfort, and, in consequence, our priorities should reflect this. The move to introduce NOx controls can only be seen as a misplaced concern for minor environmental improvements at the expense of energy savings and transport economics.

6. There has been comment on the value of diesel engines for economical use of fuel. While it is perfectly true that the intrinsic properties of the compression ignition cycle allow the extraction of more heat energy from the fuel charge, I am opposed to the encouragement of diesel applications by giving pricing or tax incentives. These are in effect subsidies to the operators of diesel vehicles which distort the vehicle market at some considerable economic penalty to the state or to other individuals - such as users of petrol vehicles.

If the economic advantages of the diesel are evident when the price per calorie of diesel fuel and petrol are equated, then the choice of diesel is justified. If the advantage to the operator is only apparent when he is given a substantial subsidy, then it cannot be good economic Community sense to encourage a move to diesel engined vehicles.

There can be no law that says we should pursue fuel economy at any price. An economic evaluation must be made, and when doing so, I believe it is useful to examine alternatives on the basis of their use of thermal energy from the primary fuel. On this basis diesel fuel should be about 7% more expensive than gasoline because it has more calories per litre, and the value of electricity generated from oil should be about 2 KWh = 1 litre of diesel fuel.

When comparing the fuel efficiency of cars powered by petrol, diesel or electricity, these fuel cost relationships should be observed.

7. Positive measures on which local and national governments could take initiatives include the provision of well designed road networks and intersections, the elimination of traffic bottlenecks and through traffic from towns, as well as other causes of congestion, and a moratorium on significant new legislative requirements, for example, until 1980, to allow manufacturers to concentrate their resources on vehicle design for economy of manufacture and operation.

8. In conclusion I would like to make four last points of importance when considering measures to improve the fuel economy of road transport :

8.1. In Europe there are approaching 100 engine families whose productive equipment must be modified to introduce significant changes.

8.2. The extended time scale and the demands for capital and machine tools to bring in radical changes to so many engine and vehicle plants must be considered when major changes are proposed.

8.3. The design changes required for emissions, safety and noise all interact in the total vehicle with changes required for fuel economy progress. Legislative programmes must recognise this fact and future requirements in all these fields need to be packaged in terms of their introduction dates.

The earliest date when such a package might be initiated would seem to be 1980.

8.4. The objectives of future legislation need to be defined, their problems investigated and their implications reviewed in a planned manner. I commend the Commission to consider introducing a timed comprehensive plan of proposed future regulatory activity covering all safety, environmental and energy issues affecting road transport. Such a regulatory Plan should be reviewed with those affected, to evaluate timing, costs and benefits, so that a programmed move towards the desired objectives would result, and better management of the Community resources would ensue.

Intervention of Mr. VAN LAER

1. It is not my intention to comment on Mr. Sezzi's entire presentation, but only to deal with some individual aspects of it.

2. First of all the importance of harmonizing the laws governing the taxation of transport in the various EEC countries should be stressed. This harmonization should not be the outcome of random compromise, but must be deliberately aimed at energy saving. The principle of harmonization may indeed easily be extrapoled in the case of all other regulations.
3. The introduction of a "Consumption cycle" applying to prototypes and checked on production vehicles for the purpose of producing economical vehicles seems to be a sound idea. Such a consumption cycle should be able to be carried out at the same time as the air pollution test. Either maximum consumption standards could be applied or the results obtained could be made suitable for publication for public information purposes. The second method seems to me to be much less appropriate than the first, since in many cases consumption is not the decisive factor in the purchase of a car.

   In my opinion, the effort must not be made solely by the manufacturer since a lot can be done in other areas - not necessarily by adopting spectacular measures. Some have been mentioned by Mr. Sezzi i.e. :

   1. restricting maximum speed to an economical level;
   2. easing traffic flows within towns.

   In addition proper consistent engine tuning can yield great economies. It is true that this currently leaves something to be desired and it would be a good idea to devise ways of remedying the situation.

   I doubt that higher taxes on petrol would have any appreciable repercussions on total consumption if there were no suitable, alternative public transport. The emphasis must not be placed so much on price here as on frequency, speed, comfort and accessibility.

4. Although motor vehicles are currently approached from two standpoints, namely emissions and consumption, it must be ensured that these do not counteract each other. On the contrary : a synergetic effect must be aimed at. It is therefore essential that emission standards are and remain realistic.

   It would be saddening to have to note that, for bad reasons, anti-pollution systems would have to be used which caused consumption to be increased.

   Therefore in this connection,it is also important that further work into "clean" engines should be devoted to consumption. In my view therefore, where necessary, vehicle performance takes second priority without sacrificing driveability and the principle of optimization. I would go so far as to say that "sporty driving" must give way to "economical and sound driving".

5. We learn from table 8 in Mr. Sezzi's paper that transport accounts for about 20% of petroleum consumption. This means that 80% is consumed for "non-transport" purposes. It is therefore logical first of all to attempt to wean the latter group from petroleum before starting on motor vehicles where, indeed, the problems are much more difficult to solve .

6. I would very like to raise the matter of the diesel engine. For medium- and heavyweight(over 3 tonnes) there is general agreement that the diesel is the most suitable type of engine. For motor cars and light commercial vehicles the situation is rather different. The number of such vehicles powered by diesel engines is relatively low and they are claimed to have the following characteristics :

   - poor acceleration;
   - a fairly low maximum speed.

   If these drawbacks are accepted a genuine overall fuel saving will be achieved but if such disadvantages as poorish acceleration and a lower maximum speed are <u>not</u> accepted the gain in urban traffic will be slight and at cruising speed it will be zero. A choice must therefore be made and I feel that the first choice must be energy consumption as, indeed, I have already said.

7. I would also like to draw attention to the multi-fuel engine which could play an important part in the future. It is in fact capable of operating on a wide range of fuels, so that it can adapt to the supply revolution as a function of energy policy. Let us also not forget the existence of the hybrid engine, as it is known, which combines the efficiency of the diesel with the driveability of the spark-ignition engine.

8. The gas turbine was not included in the list of "other" power plants for engines even though it could have been added.

<u>Intervention of Mr. PLASSMANN</u>

The preceding speakers have already said a great deal of what I wanted to say so I could perhaps restrict myself to one or two essentials. I would first of all like to warn you against reducing everything to abstracts and relating it to a European or world milieu. The figures which we have heard this afternoon were very interesting but I feel that this juggling with figures can nevertheless take on a different complexion from country to country. I would like possibly to dwell on this point a little longer.

I feel also that we ought to perhaps say, since no-one has done so already, that our European motor and engine industries have made considerable progress on fuel consumption efficiency anf that it will therefore be very difficult to achieve what is expected as regards all the efforts and the implementation of all of these measures mentioned here today, and which have been summarized by the rapporteur in a highly detailed and interesting manner. These perhaps rather high hopes should therefore be curbed somewhat. The discussions which took place this morning and this afternoon have shown that energy saving, protection of the environment and finally also safety can only be viewed as a whole. The measures proposed will have to be implemented in several small stages. Individually they will achieve very little success in the short term, but after their gradual introduction they will perhaps bring some success in the longer term.

I would, however, like to add a few comments and point out one or two things which might be important, might achieve a certain success more quickly than many technological measures and which in the final analysis must back up the technological measures to be introduced so that their significance is not reduced. These are measures which only determine energy consumption and exhaust gas emmissions indirectly but nevertheless do so decisively.

I even feel that under certain circumstances their repercussions could overshadow or nullify the success of the indirect measures which we have discussed i.e., the vehicle specific measures.

I would like briefly to mention that it will in my opinion be necessary to improve the service life of the mixture-preparation and ignition systems in future, together with a reduction in servicing requirements, so that workshop servicing efficiency can also be improved.

I feel that the introduction of traffic-specific measures (and I am not thinking so much here of speed limits as of traffic control) can help to improve things considerably in city centres. I am also thinking here of the introduction of reality relationships and fuel consumption tests, such as already exist in the USA. Influencing driver behaviour itself can also be of importance, but if we wish to carry through such measures, intensive publicity will be needed in future.

The diesel engine has been discussed and the pros and cons evaluated. I am of the opinion that the diesel engine should be developed further, its well-known advantages due to thermo-dynamic processes retained and its drawbacks gradually eliminated. I feel that we have little to hope from unconventional power sources in the distant future, since they must measure up against further developments of and also existing highly developed conventional prime movers, namely petrol and diesel engines. In my opinion they will only stand a chance if they are superior to these by a wide margin. In my view this also applies to the gas turbine.

In conclusion, perhaps I might touch upon fully synthetic fuels .

The use of alternative fuels is also under discussion and study in West Germany but the use of such fuels with methanol, and in the distant future perhaps hydrogen, is not so much a question of engine development or suitability but in my view a question of their economic production.

Mr. Chairman that concludes my remarks.

Intervention of Mr. LE GUEN

The problem of Energy Saving must be examined from two different but complementary viewpoints. Once the choice has been made of propelling a vehicle by using an engine, two things have been decided :

First : to expend an amount of energy corresponding to the inertia of that vehicle and,
Secondly : to produce energy or more precisely to convert stored energy into a force usable for propulsion.

We therefore propose to look at the economies which can be made from two angles :

- how to arrive at the least possible inertia and also how to improve the efficiency of the energy converter which may or may not be mounted on the vehicle.

As regards the last point, everything has already been said about the possible improvements of motors used on existing vehicles.

Internal combustion engines or diesel engines coupled with mechanical or other transmissions, gas engines, electric motors and transmissions, hybrids and the least one could say is that the economies which can be expected are well known and unfortunately poor, with the exception of course of extraordinary and unexpected discoveries which are however, always possible.

On the other hand the way in which the vehicle is driven bears improvement and the rapporteur has clearly shown the role of the driver. Could we go further and envisage controls which avoid energy wasting ? Yes, without the slightest doubt, but that would adversely affect not only the enjcyment and pleasure of driving which, incidentally, have already been much eroded, but also safety, and here we need to exercise caution.

From the point of view of energy output then, a possible improvement but of a very limited scope, we believe. On the other hand - on the utilisation side - improvements are possible.

These improvements are of different types. Equations of motion show that one can take action on six different points :

Three connected with the vehicle :

- Weight;
- front surface area;
- coefficient of aerodynamic drag.

Two connected with the driver and to a lesser extent,the traffic.

- speed;
- acceleration.

Finally, the last one is connected with the infrastructure of the road system :

- gradients.

We will touch on these last points quickly. Measures have already been taken to limit speed on roads and motorways, but these limits have probably, as a result of traffic conditions, only a small effect in practice although important theoretically and therefore psychologically.

For gradients and acceleration, very long term action is necessary to make even slight progress. Changing road contourage or driver behaviour is not a simple operation but one which in addition can only be undertaken by public authorities.

If then no effective action can be taken as regards the road network or the driver, what then can be done to the vehicle and at what cost ?

As regards the weight, we can already say that it is obligatory for commercial transport, and therefore no action is possible unless, possibly, on the deadweight. As regards private cars we can, at least for the lighter ones, reduce the mass considerably, but this would be done at the expense of comfort, which is increasingly demanded by the consumer and, above all, of safety which is required by regulations.

Again, regarding front surface area, any decrease in the width and height of the vehicle is automatically translated into a smaller energy requirement. But here again the same problems mentioned before arise : that is that comfort - in so far as interior room is concerned, not the mass suspended, as in the case of weight factors - will be reduced, particularly as regards lateral impact which is particularly dangerous and the protection against which is directly linked to the distance between the passenger and the side of the vehicle.

Finally, the coefficient of aerodynamic drag can doubtless be improved both on private cars and on utility vehicles. Stylists will certainly be able to find forms pleasing to the public which at the same time are aerodynamic and retain sufficiently roomy interiors and useful luggage space. Progress can certainly be made on high density traffic and also on the air flow between the road and the undercarriage.

These three points should also be considered from the point of view of the user. It is the user who has to ensure that the efforts made at the design and manufacturing level are not negated by the bad use made of the vehicle.

In particular the user should take care that no useless load is permanently carried in the boot or elsewhere. All roof racks and other gadgets increase the front surface area and can only result in higher - often considerably higher - consumption.

Thus any action taken on one parameter reflects on the others and everything is only a question of compromise. Seeking the optimum is a function of the importance given to one factor or another. Until now, in an era of cheap energy more weight has been given to the wishes of the user, to greater comfort, better "habitability" and more recently, at the behest of the authorities, to improved passive safety. With these parameters all leading in the same direction, the vehicles have tended to become progressively heavier and more spacious.

When the energy problem becomes critical, more emphasis will be placed on energy saving and the desired optimum will be more affected by the parameters we have just looked at and relatively less by parameters of safety and comfort desired by the user. Vehicles will become lighter and less spacious with the attendant inconveniences.

This evolution entailing profound changes in vehicle design will need long and expensive study.

Research into the consequences of modifications necessary to improve energy utilisation on comfort, safety, prices and profitability at manufacturer level, but also efficiency at user level, will enable the best optimum to be set. This evolution will be slow because of the time needed for research and the production lead time for new models, and will not justify itself economically except in the very long term because of the time necessary for part renewal.

We must also set this new optimum with a great deal of caution, and I think it is reasonable to hope that it will be the same at least for all the countries of the European Community.

GENERAL DISCUSSION

Intervention of Mr. Cornell

Listening to the papers both this morning and this afternoon leaves me one of the frustrated engine development people in the room. In my group I have some people working on air pollution and, to go beyond the Regulation 15 as we know it today, we are working very hard to meet more severe standards; everything we are doing makes fuel consumption worse. On the other hand, I have the energy crisis; I have another group working very hard trying to improve engine efficiency. One thing we did not talk about today is noise; we also have people working on noise which means larger engines turning slower. We were told this afternoon that that is bad as far as fuel consumption is concerned. So it all depends on the approach that is taken on all these many imports.

We were accused this morning of wanting to make studies. Mr. Gauvin mentioned that he wants to up-date the studies which were made in 1971 by the fact finding group which Mr. Vrijburg so ably directed. It is very nice to have the facts and this does help quench the hysterics. There are two approaches. Mr. Gauvin wants the studies and therefore the facts so that he can make decisions;the other approach is more around the emotional lines where decisions are made without taking time through the study. Which approach is used is anybody's choice. The important thing is that decisions must be made. As far as air pollution and fuel consumption are concerned, through a lot of hard work, you now have a shopping list to choose from. All away from Regulation 15 to the engines we were told about, we shall meet the California Regulations without using the carburated method. As we and all the technical people know, these are really inefficient engines. Because of the shopping list, the decision is not really a technical decision; it is a political and economic situation.

We talk about the cost of these things - so many dollars, so many francs, so many DM. This is not really important. Mr. Stork mentioned this morning 100 to 200 dollars, and considering our options on the cars this is unimportant, and I think it is a point of view. We have seen the real economics involved. It is not the percentage in the increase in the car. The car customer, our customer, is a very intelligent person, if he was not intelligent he would not have enough money to buy a car. He solves the question very easily because he buys the car a year ahead of time before the legislation takes effect and he saves money. What is the effect of this?

It is a boom year in the automobile industry followed by depression. These are the economics that must be looked at. The USA went through it, Sweden is having a boom year; you do not have to be very 'smart' to know that they may 'bust' next year. Japan had a very serious pollution problem, they had severe standards coming in; result: boom year this year. What is going to happen? Next year they are 'bust'. Therefore everybody must visualize the economics in the true meaning; it means a great displacement in manpower and materials.

The boom year is a shortage of everything, it is inflationary price increases; the next year, people are out work. We talk about improving the well-being of people, all we have to do is ask the millions of unemployed in the USA if their well-being has been improved. These are things that must be considered when considering the economics and not just the dollars, francs and DM.

Answer of Mr. Zanoni

Unfortunately I think I have little information, in fact none, to reply to Mr. Cornell. My report deliberately dwelt on the technical aspects of the problem but that does not mean that the economic side was forgotten, since I was dealing with one of the main features of the economic picture. As a technical engineer, I thought it better to discuss those aspects of the problem which fell within my sphere of competence, merely pointing out where the purely technical side gave way to the economic. I do not think, therefore, that I can give a full reply to Mr. Cornell since there are too many problems which are interrelated both economically and technically. Moreover I do not think, in all honesty, that I can hazard any economic predictions.

Intervention of Mr. Montabone

I should like to reiterate and possibly amplify the reply from my colleague Zanoni. The problem raised by Mr. Cornell is mainly connected with future legislation on nitrogen oxides. If nitrogen oxides are maintained at the present level, then Mr. Sezzi's report answers the question: we are at the moment at the lowest consumption level, compared with 1970. I think we must thank the Community which, by imposing limits on emissions, has forced us to reduce consumption. There is reason to suppose that consumption will start rising again, but it is not yet possible to say how far.

Intervention of Mr. Pahnke

This morning we heard a lot about California cars. What was not said is that the fuel consumption of the California cars is 10 % higher than the fuel consumption of cars meeting the standards in the other 49 states of our country. I want also to go on and talk about something that a Dr. Cantwell of our laboratory presented earlier in the year at the meeting of the Society of Automotive Engineers. His paper was entitled "The effect of the emission standards in gasoline quality on fuel consumption". In this paper, Dr. Cantwell presented experimental data obtained on 34 recent model US cars, showing the relationship between fuel consumption and octane requirement. This information was combined with estimates by the petroleum industry of the additional energy required to make higher octane gasoline, to determine the optimum octane quality of leaded and unleaded gasoline. The results of this study for the US showed optimum quality was 100 octane numbers for leaded gasoline, and 96 octane numbers for unleaded gasoline. The use of leaded rather than unleaded gasoline saves 6 to 10 % of the crude oil required to make the gasoline. This relationship was determined by varying the spark advance of 34 US cars and making measurements of octane requirement in fuel consumption.

Changes in compression ratio would have probably produced a similar relationship, as we were thwarted by data in the literature. These data were determined using the CBS 75 procedure, so they include motorist type driving conditions. By increasing the octane requirement from 87.5, which is the optimum quality of the US unleaded fuel, to 100, a 14 % reduction in fuel consumption is produced.

Estimates of the additional crude needed to make higher octane gasoline were provided by three major US refiners. The unleaded curve is the average of these three estimates. The leaded curve was obtained by simply adding the octane value of 0.53 grams of lead per litre. (The amount of energy needed to make lead is very small and can be neglected for the purposes of this discussion.)

Answer of Mr. Zanoni

Mr. Pahnke's reference to the data on the relationship between the octane number of the petrol used and a vehicle's consumption gives me an opportunity to reply indirectly to one of Mr. Montabone's comments. When I presented my report which I intentionally, and with reason, described as an example of a method (see Fig 9 of the report: refinery consumption and vehicle consumption) I said that the bottom part of the graph, which showed vehicle consumption as a function of the research octane number, gave data obtained from the literature (and so also partly from the study by Dr. Cantwell, quoted by Mr. Pahnke). This curve is only an example; many of you know that for some types of vehicle, instead of sloping as in Fig 9, and dropping from 10 400 kgc per 10 km at 90 octane to 9 200, the curve is almost horizontal.

There are types of vehicle, with higher or lower compression ratios and therefore requiring a higher or lower octane number, whose fuel consumptions are very nearly identical. At this point, going back to what Mr. Izard said regarding the octane requirement spread for the various vehicles, you will see that my figures correspond to what he told you. He was using data based on one thousand vehicles whereas I am talking about ten vehicles of the same model which should, officially, be the same. These vehicles have an octane requirement spread from 90 to 100; if the real calculation were made, the best value obtained would be 98-99 RM with 0.6 lead. So what octane requirement level shall we have for these vehicles? Must we take 90 or 100 or a value between these two? In such cases, if the automobile industry is able to bring all ten vehicles down, not necessarily to 90, but at least to a narrower spread, the real curve on which the real experiment was or should be based might level out at 9 600 rather than sloping from 10 400 to 9 200. In that case everything we gain, for example fuel with a 0.4 lead content, which brings us down from 2 300 kgc to 1 200 kgc, is a net gain.

Intervention of Mr. Aitken

In the report of Mr. Sezzi the point has been made that a diesel engined passenger car has lower fuel consumption than a gasoline engined vehicle and that less energy is required to manufacture gasoil than gasoline. Could you indicate what overall saving in crude oil, say tons per annum per vehicle, would result from changing from a gasoline to a diesel engined passenger car? What percent this crude at saving is in relation to the total crude oil need in the Community for all purposes?

Answer of Mr. Izard

I think the best way I can answer this is to use some data which we generated for another purpose and develop it from there. I shall just make this point clear: this is data generated for the purposes of my own company, but I think that it will be fairly realistic for much of the oil industry, as a whole, anyway.

What we were interested to do here was to look at two cases, one where we have full flexibility in the refinery and another where we need to go into mild conversion; some people might have to go into more intense conversion. What we have endeavoured to assess is the additional energy required to make the diesel engine. You may recall that I talked of the large component of energy used in making the materials of construction and that is what that work presents as diesel versus gasoline.

"The energy saved in the refinery" is the next heading. The fuel saved on the road by the car itself which will be averaged out against the existing gasoline engine consumption figures for Europe, and I made an assessment between the top and the bottom for the diesel economy. What we really come down to, if we assume a ten year car life, is that in one case we would be having an average saving per car per annum on crude of about 0.35 tons, and in the other case, we would expect to see about 0.52. Now I think there have been some estimates made in other documentation that if diesel car development went ahead on an increased scale, we could have in the market place something like ten million additional diesel engine cars in Europe. Therefore, we would be showing a saving from somewhere between 3.5 million tons and about 5.2 million tons on crude. You have to set that against the expected total energy consumption from crude in the Common Market in 1985 of about 900 million tons.

So we are looking at a saving from this quarter, assuming you build ten million additional diesel cars between now nd 1985, of about 0.4 % and 0.7 % saving. Now those do not sound awfully large numbers, but they are savings nevertheless which could be of some significance in another direction. I think for this purpose, that is the best answer, I can give, Mr Chairman.

Intervention of Mr. Rossini

Pending the introduction of stratified-charge engines, or engines in which vortex-controlled combustion achieves substantial reductions in octane and cetane requirements, thus changing the energy balance sheet by cutting down the refining stage, I would like to draw attention to a few points about which we know too little and which are of undoubted technical and economic importance.

1. We have talked about octane demand, in other words the number of octanes needed in order to prevent "knocking". In general, the term "octane deficit" is also used, meaning the difference between the octane required and that which is available, i.e. the deficit which the engine can tolerate. Recent experiments carried out at oil laboratories and motor vehicle laboratories show that this index of tolerance is out of date, because it has been found that as the number of revolutions of the engine increases the tolerance diminishes, for instance, from 4 to 1.5. To express tolerance in terms of octane deficit is already an indirect form of expression (in fact we should know what amount of knocking can be tolerated by the engine); to refer to an octane deficit of, for instance, 4 numbers is to talk about something which means one thing at 80 and another thing at 100, because the octane numbers are measured differently and those approaching 100 count for more. We therefore have only an indirect and, what is more, non-linear indication. The experiment referred to earlier, which concerned a tolerance of deficit between 4 00C and 5 000 revolutions per minute, shows that the deficit which allows smooth running of the engine falls from 3 to 1.5, in other words to a value which lies within the range of accurate determination. This is therefore a point which must be solved beforehand, by considering the true nature of knocking and by measuring the squares of the overpressures. Only when these precise calculations have been effected shall we be able to do our energy accounting.

2. We must break free of the uncertainty of the CFR[1] method and a system based entirely on statistical calculation; we must define more clearly the burden which weighs on the fuel and on the air in terms of the compression ratio, filling ratio, fuel/air ratio, and number of revolutions. I think that modelling studies such as those of the Institut français du pétrole should be encouraged. Under the auspices of the Commission, I believe much could be done in this direction.

3. One more comment on the way in which energy balance sheets are drawn up, such as in the report by Mr. Sezzi or Dr. Pahnke. Maximum consumption values, when based on optimum octane values, give a flattened curve, so differences of one or two octane numbers should not cause surprise. But all these studies are no more than an approximation since they do not introduce the average value of the longest duration of pressure in the induction manifold. I was happy to see Mr. Izard draw attention to this point. But this

[1] Cooperative Fuel Research Committee

takes us to a very important third area of research, which links up with the questions discussed by Mr. Montabone. We cannot consider the compression ratio in isolation (even less the compression ratio in isolation, for a given throttle opening); we must consider the vehicle in operation. Calculations must therefore be done on the assumption of a certain cylinder capacity and a certain final drive ratio. This represents an initial step towards rational utilization - a small but not negligible step; and some American and European models have already been designed along these lines, with the result that substantial energy savings have been achieved.

It is the incentive of energy saving that is making us relate vehicle performance more closely to fuel performance. It is the prospect of the possible achievement of such a saving which induces us to draw a different conclusion from that drawn by Mr. Izard. In America, before the battle against air pollution got under way, a rational solution was found by combining rather low inlet pressures with high compression ratios in order to reduce consumption. In Europe, on the other hand, having aimed at high specific consumption values, we found ourselves with carburation systems which were good at high revolution counts and full throttle, but which caused power drops and increases in consumption when there was a fall from full throttle to a low revolution count. Any changes - be they apparently modest, yet fundamental - to help improve the composition of the mixture represent major steps forward.

4. One last question which remains to be settled concerns not only the behaviour of fuels at high revolution counts but also the problem of "lean mixtures". Whereas there is a steady move towards the combustion of lean mixtures, we do not yet have at our disposal a scale of reference for assessing fuels. This point is crucial because it is relevant to the short-term measures which are being taken pending the arrival of the new engines, which will also benefit from such research since stratified-charge engines take in more air and are therefore undoubtedly more susceptible to knocking and pre-ignition.

Answer of Mr. Zanoni

I would like to endorse what Mr. Rossini said when inviting us to pursue our research. And I would like to point out that a programme of research has already been undertaken, under the auspices of the Commission's Study Group C, in cooperation with three European industrial associations. All the problems raised by Mr. Rossini have been included in the programme. I know that we shall have problems and doubts in our efforts to determine, for instance, the octane requirements of vehicles. But it seems to me advisable to begin this work by using the means which we already have at our disposal and by applying existing methods. At the same time it is obvious that more specific research can be carried out and I would add that this is already being done at national level and in industrial laboratories.

Intervention of Mr. Jacobson

Basically I think before we finalize our concepts of the requirements of energy conservation on the one hand, and air pollution control on the other, we ought to consider whether the type of fuel which we are deriving from the North Sea is different in composition from that on which our previous studies have been based, (that is the main sources from the Middle East and Africa), and whether in fact the fuel or rather the petroleum products, are more suitable for burning in mobile transport engines rather than in industry and for home heating and petrochemical plants. Does it not therefore still mean that we shall depend on Middle East crude largely for industrial usage? If so, is that not dependent on the degree of industrial activity rather than on throttling or reducing the demand by the car or commercial vehicle user? Could Mr. Izard please confirm whether any adjustment of our targets, both in terms of energy conservation, and also in terms of pollution emission levels, should be considered, since I believe that the natural state of the North Sea Oil is sufficiently different in terms of, e.g. aromatic contents and lack of sulphur, to require a different approach by the legislature.

Answer of Mr. Izard

Let's get one thing clear about the North Sea Oil. It is indeed a lighter crude, if there is in fact one North Sea Oil, but I think that we must make the point here that, as in the case of Australia, there will be a need to import crudes from elsewhere, since the North Sea will not yield us the lubricants and bitumens, asphalts, call them what you will, that will be required for other purposes. So we shall, in fact, have a mixed crude slate in Europe when North Sea comes on stream. Having said that though I do not believe that we shall be seeing any difference essentially in the motor gasolines and the automatic gasoil that we shall manufacture from this mixed crude slate and I do not see that this has any bearing whatsoever upon the automotive emission standards in the light that we have been discussing here.

Intervention of Mr. Dartnell

I wanted to make the point, Mr. Chairman, that with respect to the use of the passenger car, a study has been made in a city that is being built very close to where I work. In practice, in terms of public transport, which was touched on today, people who can choose to use a car or ride a bus, if the journey by bus is taking no longer than the journey by passenger car, and that includes the time waiting at the bus stop and the time walking to the bus stop, than 50 % of the people will choose to use the bus. If in fact it takes ten minutes longer, only 10 or 15 % will use the bus. If in fact the bus journey takes 20 minutes longer, of the people who can choose, no one rides the bus. For this reason this city is being built predominantly on the basis of the usage of the passenger car.

The other point that I would like to make, is to support Jean Salony with his estimates of the extra crude oil used or extra energy used if lead is reduced or an octane number is reduced. I think this is very important to remember because in our search for clean air, I believe it is very important, indeed, to tell the total story. In other words, we must talk about the debit side since future generations will surely judge us very badly if they find we have needlessly bought millions of extra tons of precious crude oil supplies in order to obtain pollution-free engines, or virtually pollution-free engines. Although I recognize that thousands of people are cured every year from accidents, but I would submit that not one single person is killed nor even hospitalized through the emissions arising from the motor vehicle.

Comments of the Chairman, Mr. Brondel

I think that we can begin by saying, contingent on the statements which have been made, notably by Mr. Montabone, that the most appropriate utilisation of petrol is probably for road transport, since at this moment we cannot envisage any satisfactory substitute for combustion fuels, even in the relatively distant future. This fully justifies the most rational possible utilisation of these fuels.

Secondly, I believe that we should keep in mind, following the discussions, that the objective of more rational fuel utilisation must be sought parallel to the concern for retaining safety and for the environment. In other words, I do not believe that we should set ourselves separate objectives which would necessarily be contradictory, but that we should try to find the best combination so that we can arrive at a satisfactory solution for all three problems.

The regulations and norms necessary to achieve these objectives must take into account the whole economy, that is, I believe that we have to set ourselves objectives which can be met while satisfying economic conditions.

These regulations and norms must, as far as possible, be set at European level, so as to maintain all the advantages of a linear market and I believe that in doing so the Community's role will be decisive.

More specifically, as regards the reports of a technical nature, we have seen that there are numerous factors which can influence fuel consumption in vehicles for which we must work out a better synthesis, factors which depend, as the rapporteur has said, on the consumer or on the vehicle. Another point which has been mentioned is that of the research which is still necessary to clarify the components of the problem and arrive at a better solution; I feel that it is the task both of the automotive industry and the petroleum industry and probably of both in cooperation to find the best possible fuels/vehicles adaptation.

We must be glad of the experience which has now been gained jointly by the automotive industry and the petroleum industry on a number of engines using different types of fuel currently on the market. I think that these tests will be of great importance whether in indicating the direction we should take to achieve progress in engine development or whether in setting realistic regulations and norms.

Finally, as a last point, I feel that the Commission could undoubtedly make an important contribution towards finding the best possible solution to these problems. We have set up a sub-group C which is working on rational energy utilisation. We have already established, see first report, and made recommendations.

I feel that the discussions we have had today will encourage us in working towards short term objectives such as better driver behaviour, or providing drivers with better information on the characteristics of vehicles and best use that can be made of them, or in stimulating the car or parts manufacturers to find ways of making the driver more aware of his own interest in saving fuel. In the long term we have to work towards more concentrated and coordinated research.

Final conclusions of Mr. Zanoni

The discussions that followed the presentation of the report of Session 6, even if too brief with reference to the wideness and complexity of the problem, have enabled us to emphasize a number of more important items and to make a number of general considerations as a basis for improvements to the present situation.

First of all, general considerations:

- Mineral oil is best used in road transport, where there is not likely to be any satisfactory substitute, even in the distant future. This is a good reason for seeking to make the most rational use of fuel.
- Work on the rational use of fuel should take full account of the need to ensure safety and the protection of the environment; on the other side any action to ensure safety and the protection of the environment must take account of the need not to influence too much the vehicles comportment in relation to their consumption.
- The necessary regulations and standards to reach the goals shall be drawn up in the light of the overall economy of Europe in such a way as to retain all the advantages of an open market. The Community's rôle will be a determining one here.

Having regard to these general considerations, I think it is possible to make some suggestions:

- An attempt should be made to define the best combination of the various factors involved in fuel consumption. These factors depend both on the user and the design of the car. The first of these - which can give immediate results - include choosing the best vehicle for the job and setting-up a permanent consumer information systems to advertize the savings that can be made by proper driving. It is up to the manufacturers to make as many improvements and adjustments as possible to vehicle design.
- I think that the main point resulting from the discussions is that thorough research is still needed here in view of the vast number of interrelated factors involved. The mineral oil and the vehicle industries should seek in common the best possible car-fuel combination.
- With a view to making such research as effective as possible, sub-group C (RUE programme) at the Commission of the European Communities has drawn up a draft programme of study and invited a number of Community associations from the mineral oil and the vehicle industries to help with the research plan in their particular field.

Such a programme may be considered ambitious at a first view, but it is reasonable and necessary. The panel members and the participants to the discussion considered that the results of the works of this group will be very positive for the motor cars and fuel industry and for consumers as well.

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OPENING ADDRESS FROM MR. SCARASCIA MUGNOZZA
Vice-President of the Commission of the European Communities read by Mrs. Deshormes

Mr Scarascia Mugnozza, Vice-President of the Commission, regrets that he is unable to attend this meeting in person and has asked me to read his address.

The Commission of the European Communities has always regarded the improvement of road safety as one of the major objectives of the common transport policy. In the communication on the common transport policy which the Commission sent to the Council on 25 October 1973, it expressed the view that "the Community must contribute to the action taken by the Member States and international organizations with a view to improving safety in transport, particularly road safety". There is no doubt at all that, within the Community, there are still disparities in the legislative and administrative provisions - or gaps in such provisions with regard to drivers, vehicles or roads - that hamper traffic between Member States and thus impair the efficiency of road transport.
In the past, in view of the need to attain the immediate objective of the common transport policy, the line taken by the Commission in the field of road safety was mainly to support action initiated by other international organizations and to recommend the Member States to ratify as soon as possible the agreements concluded within those organizations, e.g. the agreement on the transport of dangerous materials.

It was only during the sixties that the Commission found it possible to pinpoint some priority objectives within its own general policy for the improvement of road safety.
The reasons for this were threefold :

First, there was the steady increase in the number of road accident victims and in the social costs resulting from road accidents.

Secondly, the ever greater deterioration in conditions on all the road networks of the Community, was adversely affecting the volume, fluidity and safety of traffic; moreover it was evident that the growth of road transport between the Community countries, together with the rapid expansion of tourist traffic, would inevitably lead to still greater congestion and hence to diminished road safety.

Lastly, the implementation of the transport policy had reached a stage at which the economic aspects of the Commity system no longer had to be given sole priority : it was now necessary to consider the qualitative aspects of that system, among which priority was accorded to road safety.

In 1971, therefore, the Commission presented a Memorandum on the guidelines for a Community project aimed at improving road safety.

In this Memorandum, the Commission put forward a plan for seven priority measures which can be briefly summarized as follows :

- measures to standardize and tighten up the requirements for the issue of driving licences;

- the introduction of a system for the periodic inspection of road vehicles;

- joint consultations on various provisions relating to speed limits;
- stricter regulations concerning driving under the influence of drink;
- compulsory courses on road safety for schoolchildren;
- common standards for road signs;
- pooling of experience by the Member States as part of a joint programme of scientific research on the causes of accidents.

With regard to the first two points, proposals on licences and inspections have been laid before the Council and discussions on speed limits for industrial vehicles are currently being held with Government experts.

However, the world of transport is in the throws of rapid change, and questions that seemed relevant at Community level in 1971 may have lost some of their importance in the light of subsequent events, whilst others that seemed to have no particular relevance at that time may since have acquired priority status.

Statistical data on road accidents are not only of value for an assessment of the economic and social advantages that accrue from existing or planned legislation, they also help towards a better understanding of the dynamics of safety.

As their interest in the problems of road safety deepens, the competent departments of the Commission are becoming more and more aware of the need to have at their disposal not just any kind of statistical data but, above all, data that can be used in the decision-making process.

As an international organization, the Commission has to go by the relevant "international" statistics. It must be pointed out, however, that since the majority of statistical investigations are still the outcome of national initiatives, the "credibility" of the information and its usefulness at international level is very often limited.

For the purposes of the user of international statistics, it is clear that the information must satisfy many complex requirements : to mention only the most important, the data must be presented in a comparable form, they must be processed in a uniform manner, and they must be kept up to date.

We are aware, of course, that there is some incompatibility between the requiremend that the data should be complete and accurately processed and the need for regular updating.

With the use of modern processing equipment, however, and with better and more frequent cooperation in this area between the various countries, it ought to be possible to make some progress in this direction. It is worth noting that the number of decisions and standards adopted internationally in the field of road safety is certainly going to increase, and the demand for relevant international statistics will be heard more and more frequently. All this has a bearing, especially since the mounting volume of international traffic calls for the unification of road safety standards among the Community countries.

It cannot be repeated too often that the availability of reliable, internationally comparable data is indispensable if we wish to ensure that the Community adopts valid and effective safety measures that will benefit the citizens of all the member countries.

Hence statistical data are an important factor in political decision-making and a major issue for us here today. The Commission attaches great importance to this seminar, which, with such a highly qualified attendance, can be expected to produce some extremely valuable results.

I thank you in advance for the valuable contribution that your deliberations will make, and wish you success in the work ahead.

Opening speech by the Chairman, Mr Jacques Mayer,

Ladies and Gentlemen,

On behalf of the Statistical Office of the European Communities, I should like to thank you all for attending this Seminar and also to thank Madame Deshormes for the very clear guidance she has given to our work on behalf of Mr Scarascia Mugnozza.

From the point of view of the Statistical Office, what do we expect this seminar to achieve ? Its purpose is to provide us with information and basic scientific data which will enable us to go ahead with our project in the field of road accident statistics. This project is not a new one : it was put in hand in 1971 and continued in 1972. Two meetings of national statisticians were held, although these were not sufficient to work out recommendations which would be acceptable to the Member States. The work was then broken off because the Community statistical services had to give priority to the integration of the three new Member States in all fields of statistics, and in particular in that of transport statistics, which, for the purposes of our organization, includes accident statistics. It is for this reason that there are few road accident statistics in the directory of transport statistics which we recently published, and that they are not always strictly comparable between one country and another despite the fact that other organizations, notably UNO, have already done some work on standardization in Europe. This, too, is why we welcomed the organization of an European Symposium on Trends in the Regulations concerning Motor Vehicle Design, with which this seminar could be linked.

This seminar gives us a unique opportunity to establish a working contact with the main users of road accident statistics, who in some cases are also the producers of such statistics. I feel that in 1971-72 the working party failed to make sufficient contact with the users beforehand. This had two consequences. In the first place, it would seem that the statisticians did not have a sufficiently clear idea of the existing needs and the degree of urgency : they were not well enough motivated on the subject of the harmonization and development of statistics at Community level. Secondly, there is the difficulty that statisticians encounter in making a correct assessment of the priorities to be accorded to the various requirements. Our tendency is to list these requirements, add them up and then try to satisfy them. Clearly, this is the easiest solution, but it leads to over-detailed questionnaires and over-complex proposals which in the end cannot succeed. It must not be forgotten that more often than not statistics in this field are a by-product of projects that pursue a different aim. This deters us from being too ambitious, for it is not enough to express a need that other organizations are then left to satisfy.

The first aim that I should like to set for this seminar, therefore, is to enlighten our values regarding the priorities. I should be really glad if our talks could end in agreement on the data that is most urgently needed to be collected and harmonized, on where we ought to make a start and what limits we should set ourselves at the outset. Mr Andreasen's excellent report will help us here, since it contains specific proposals.

A second kind of information that we can expect to obtain from this seminar concerns the actual means of harmonizing statistical data. In this respect the Community is in a different position from any ordinary international organization. There is a Community policy and Community legislation : hence any harmonization of national laws and regulations results in statistical harmonization. If, moreover, the statistical harmonization meets a real need, it can quite well go ahead on its own account, in this field as well as in others, backed up, if need be, by appropriate Community legislation. I want this seminar to point out the areas where we can take action, and how far we can go. Here again, Mr Andreasen's report will be of assistance, since he takes a clear stand on this point. Some may find it a negative one, others may think it ambitious, bu perhaps it is quite simply realistic. It is up to us to decide.

Perhaps, too - and this shall be my final wish - this seminar will provide us not merely with information, but with a stimulus to action. If we leave this evening convinced that progress is both necessary and possible and if we have defined its limits, you will certainly be able to help us in achieving it.

Now, a last word to save any misunderstanding. This seminar falls within the framework of the European Symposium on Motor Vehicle Design, but I want it to deal with road accident statistics in general (including those caused by motor cycles, bicycles and pedestrians).

To make the discussion clearer, we have asked some of you to form a representative panel of various categories of users and producers of road accident statistics. I warmly thank the members of this panel for undertaking this role.

Allow me to introduce them : Professor Graffard, Director of the Laboratory for Epidemiology and Social Medicine at the Department of Public Health of the Free University of Brussels, who will put the medical viewpoint ;

Mr Hartman, head of research at the Peugeot Design Centre, representing the manufacturer's point of view;

Mrs Hill of the British Road Federation, who represents the International Road Federation;

Mr Thiry, Secretary of the Standing Committee on Statistics of the Working Party on Motor Vehicles of the European Insurance Committee, who represents the insurance sector;

Mr De Regt of the Netherlands Tourist Association, who will give the road safety viewpoint;

Miss Sabey, Head of the Accidents Division at the Research Laboratory for Transport and the Roads, representing the research sector.

The report has been prepared by Mr Andreasen of the Danish National Institute of Statistics, a specialist in road accident statistics, whom we thank very much for his contribution. The working party that met in 1971 and 1972 was guided by solutions of the Danish type, and we are now following in its footsteps, whilst profiting from the experience acquired by Danish statisticians in the meanwhile.

Presentation of the paper by his author Mr Andreasen.

Even if it is not the task of a statistician to state the purposes to be served by statistics, but rather to explain the problems involded in the production of the statistics, i.e., the data-technical aspects of the subject, it is nevertheless necessary, when one is to relate an international statistical system to national systems, as I have been asked to do, to form a few ideas on what one personally considers to be, the problems which an international statistical system can help to solve.

Figure 1 shows various areas affected by decisions and various decision-making bodies which play a part in the field of traffic safety. The three bottom squares are intended to illustrate the three areas affected by decisions. To begin with there are the vehicles. They are after all what the Symposium as a whole is concerned with. There are the road users, certainly the most important factor, but also the most difficult one influence, and there is road design, which is also an important field and one which we can attempt to influence. And who is to take on the role of exerting this influence ? There are various organizations and authorities on a national level.

There are legislators, there are propaganda organizations, and there are various bodies responsible for road administration. Some of them only influence one of these areas affected by decisions.

The legislators, for their part are concerned with both vehicles and road users; but the propaganda organizations are only concerned with the road users, and the road administrators only with the roads. There is, of course, close contact between these areas, for example legislative initiatives are often followed up by propaganda campaigns which may familiarize the public with the laws enacted.

These decision making bodies need information in order to reach decisions intended to improve traffic safety. On a national level, we have information acquisition various systems. Cases arise, however, in which national sources fail to provide sufficient information and it is then necessary to go beyound the national system ant to use the international system as a basis on which to take national decisions. There are certain cases, in which I consider it necessary to have an international system of information. Take Denmark, for example - and naturally I have used my own country as my starting point - what scope have we in Denmark for exerting an influence on the design of motor vehicles? Not a great deal. We may perhaps impose requirements to be met by safety equipment of various kinds. If other countries have imposed these requirements before us, we can have vehicles meeting them, but if is is we who take the initiative and say we want something quite out of the ordinary which no-one else has, I doubt very much that we shall be able to persuade the vehicle manufacturers to adopt such changes. On the other hand, it would be possible in certain cases to put forward points of view along these lines in an international forum and, if we could convince other countries that it would be worthwhile to impose such requirements, we might perhaps get them adopted that way.

Another matter of importance is the question of checking that the decisions made are taking effect, and here we are often faced with the situation that is very difficult to check on a national level.

We had an example of this a year and a half ago in Denmark, when certain speed limits were to be introduced. There was much discussion as to whether we should divide the country into two regions, with one set of limits applying in one region and either no limits at all or another set in the other region, in order to establisch which was the right one to introduce. It was politically impossible to do it. We were forced to introduce the same system throughout the country, and the only means we had of checking whether these limits were really having an effect, and to what extent, was to apply certain international comparisons. We did not refer here directly to international organizations but used comparisons with other Scandinavian countries where no changes in speed limits had been applied. There were certain problems in this work, because our statistics are not uniform, even within the Scandinavian region. But they are sufficiently uniform to be able to undertake such a comparison. However, this is one of the points on which I think we need to be able to venture beyond the frontiers of our own countries.

Thus in the las instance it is a question which primarily concerns the researchers, and it is a question of making highly detailed analyses. Clearly, we are dealing with very complicated matters, and if we are really to delve into individual accidents and undertake analyses, with expert opinions from psychologists, doctors, road engineers, motor engineers and the police, it will be a very expensive operation. Indeed, it may be so expensive that we cannot afford to assemble a sufficiently comprehensive data base so that we are faced with the alternative of either abandoning the whole venture or of entering into international cooperation in which several countries agree, for example, to undertake such detailed analyses in limited fields. This would enable us to make effective use of scarce resources.

The traditional method of compiling international statistics may be illustraded by figure 8 in my paper. The figure shows an international system as a superstructure built up on a number of national systems, and these national systems in turn are in most countries built up as a superstructure on a number of regional systems. In the first place we have regions, which may exirt on several levels. The regions may be administrative units, and it is in these regions that the primary data collection is undertaken. The data acquired in the regions are relayed to a national system, after which comes the international level serving as a superstructure built upon the national levels. Clearly a composite structure of this kind will involve a decreasing degree of detail. Virtually avery time we pass from one level to the next we shall lose a certain amount of detail.

What demands have to be imposed on the factors which go to make up an international system built up on the lines illustraded in the figure? Three requirements must be imposed in all cases. One is that the factors making up the systems must be identical. It is not enough to use the same name, if the content of these factors is not the same. I can give a few examples of the difficulties which we are already having to contend whith, while we are on this point concerning identical factors. To begin with, we can take the question of faults or defects in vehicles involved in accidents. This is something which is highly relevant in connection with this symposium. The debate centres on what faults and deficiencies we are concerned with in vehicles. Do we mean faults and deficiencies in gneral? Do we mean all defects ascertained in vehicles which have been involved in accidents?

Or, are we talking only about faults and defects which have had some bearing on the accident? It is not made clear by some factor referred to as "vehicle defects". We must specify what we mean. By way of, I should like to refer back to the fourth meeting yesterday, when there was a great deal of talk about tyres. The question whether a worn tyre tread is a defect or not depends after all on weather conditions, if we use the term "defect" in the sense of one which has a bearing on the accident, for a worn tyre tread on a wet road is a potentially crucial factor in the accident. But if the weather was dry and the road surface was dry, it does not follow that that defect, as it would be called if the vehicle were merely received for inspection with no indication of the circumstances, had any influence on the accident. Another very important thing is the factor referred to as the accident situation (cf. figure 10 in the Paper). The EEC publications use a certain system for grouping different types of accidents. There is a group for individual accidents. There is another group comprising a whole series of accidents involving two parties. There is one for accidents involving parked vehicles, one for those involving pedestrians and one for those involving animals and other solid objects. In Denmark we work to a system of 10 groups, which is therefore more detailed than the system the EEC uses. The question now is whether these things, for example single accidents and the others, which can be specified, really are one and the same thing, as one would think from an observation of the situation and from a knowledge of its significance. It is indeed a question, for interpretations of these situations differ considerably : some see them as collisions, while others see them as descriptions of the accident situation, of the traffic picture immediately before the collision. I can illustrate this with a concrete example. If we take an accident such as that illustrated in figure 4 of annex I to the Paper, which shows an accident in which a car was about to turn left and a car coming straight ahead in the opposite direction swerved to the right and knocked down a pedestrian standing on the pavement. Here we have a radical difference between what might be called a collision, in that the car drives into the pedestrian, and what - according to the system we work to in Denmark - is called the accident situation, i.e., a description of the traffic picture obtaining immediately before the collision, which favoured the occurrence of an accident. The left-turn manoeuvre is what we are concerned with here - and it is plain to see that there is an important difference : the collision philosophy labels it an accident involving a pedestrian, whereas the alternative philosophy, which seeks to give a picture of the traffic situation, labels it a turning accident. The pedestrian is not even involved in the same situation, although of course the reporting system takes account of him and he is recorded. But he is not part of the situation.

This is therefore an important difference, which we must take careful note of when we are discussing these accident situations : we must be clear in our minds about whether we are speaking of collisions or descriptions of accident situations. I personally think that the latter approach is the correct way to apply the concept, for an important precondition to enable us to prevent accidents must be that we should be aware the dangerous situation which gave rise to the accident, rather than more or less random consequences which arise in connection with turning manoeuvres.

This is therefore one of the things we must pay attention to when setting up international systems. The next thing is that we must have an identical system of identification, i.e. an identical system assigning values to the various individual factors. It is quite acceptable to have more detailed value-assigment methods in some national systems than in others, but it is in all cases essential to have a certain minimum common reference value. I might mention an example of a factor concerning which there are a number of problems. It is the "influence of alcohol" factor, for which most national systems apply a definition which simply determines whether a subject was under the influence of alcohol or not. The limit for influence of alcohol is governed by national legislation, national customs and the way in which the police assess this problem is the various countries, and this makes it very difficult to undertake international comparisons in such fields.

Finally, there is a third question which is also important. It is the idendical relationship between different types of factor, i.e., one must be in a position to take a factor, which for example concerns the individual elements, in other words the individual road user involved, and place it relation to another factor, which applias to the accident itself. I should like to use the example from figure 4, annex I, which I mentioned earlier, again in this context. It is important, if the vehicles involved in the accident were a moped and a car, to be in a position to separate the two from one another in such a way that it is possible to determine which one was the element that swerved. Was it the moped or was it the car ? This is not possible in many of the national systems in existence today. It is therefore also something which it is important to bear in mind when working with international systems.

So far I have only dealt with the traditional way of building up these systems, but there is a possibility to which I think we should give consideration. There is a further possibility for extending international cooperation if we consider the system sketched out in figure 9 in the Paper. In most respects, it is identical with the preceding figure, but there is also a flow of data from the individual regions direct to an international level, i.e., by passing the national levels. Whether we should built this up into a formal system or whether we should keep it in looser form is arguable. But such a system would enable us to undertake analyses in depht in various regions in various countries, which would offer the possibility of securing an adequate data base. I have seen questionnaires designed for these depht analyses running to 60 pages. Clearly, with such comprehensive questionnaires ant with four or five different committees of experts, the quality of the data acquired must be high indeed, and it should also therefore be possible to be content with a lesser quantity. But data quality calls for a large amount of detail and a large number of factors. Thus we still need a large quantity of data, which could possibly be acquired it through international cooperation, in which certain regions of countries within an area such as the Common Market are selected to work together with very close coordination on a regional level. This approach would enable us to undertake detailed investigations within acceptable financial limits with the help of international cooperation.

REPORT of Mr E. ANDREASEN

1. INTRODUCTION

One of the consequences of recent developments in various technical, economic and social fields is that social problems that previously were somewhat neglected have assumed such dimensions as to call for national and international action.

Many of todays common social problems for which solutions are being increasingly required are nowadays attracting more attention. This is partly due to the increased scale of those problems and also by a change in methods of dealing with them. In the past, where the importance of certain problems was not readily quantifiable in economic terms, there may have been some tendency to consider them as a form of necessary evil which, almost like a natural law, arose from the vague concept of 'progress'. This attitude is probably changing somewhat at present, partly because of the gravity of the problems, partly because it is recognized that simply by tackling those problems we can now, more than in the past, base our solutions on economic considerations which, although not entirely accurate, may lead to a better distribution of society's limited resources.

1.1. Traffic accidents past and present

It has always been realised that accidents may occur in connection with the transport of people or goods. However, there has recently been a basic change in the nature of the accidents. In the distant past traffic accidents were mainly caused through the agency of one road-user or traffic unit. Owing to faulty design of the means of transport or insufficient knowledge on the part of road users, accidents arose as a result of the weather or an inadequate infrastructure. Accidents in the past must have been to a much greater extent of the type designated "single" accidents in the present-day terminology of accident statistics.

Continual improvement in the technical quality of the means of transport and the basic infrastructure has helped to reduce the risk of accidents from these causes. In addition, the greater fund of knowledge acquired by professional bodies in particular has improved the safety of the single, isolated traffic operation.

But, there is another very important factor which has tended to reduce the safety with which single traffic operations can be carried out, viz. the increased risk of collision between traffic units resulting from the greatly increased volume of traffic. All types of traffic have increased in density, particularly privately owned road vehicles, a type of transport unit requiring several units to do the work of a smaller number of larger public transport units.

Consequently, regular statistics of traffic accidents normally only deal with road traffic accidents, since the total numbers of accidents involving the other major forms of transport, i.e. sea, air and rail traffic, are so small that the statistics can be processed on the basis of individual accidents. In addition, the consequences of any single accident in the latter category are often so serious that they may directly result in decisions designed to eliminate the contributory causes as determined by the intensive investigation normally carried out after such accidents.

On the other hand, road traffic accidents are so numerous that it is impossible to conduct a detailed investigation of each separate one. Furthermore, the consequences of each accident are usually so slight that the one accident does not increase public concern in the problem. But owing to the great number of such accidents their cumulative effect is more serious than that of the accidents in any other traffic category.

In Denmark, for example, over 90% of the fatalities for all types of traffic accidents are caused by road traffic. Since a similar situation exists in other countries with comparable social development, there is every reason for concentrating on the problem of road accidents.

1.1.1. Economic losses

It is difficult to assess the depletion of resources resulting from road accidents since, in addition to such direct costs an expenditure on police, legal and hospital services, material repairs, etc. which may be difficult enough to estimate, certain indirect effects occur in the form of the loss to society of human resources. It is very difficult to assess these losses since they largely depend on the future development of society, the training and age of the victims and other individual circumstances. Several attempts have nevertheless been made to throw light on the economic repercussions of road accidents. Notwithstanding the inconclusiveness characteristic of surveys of this type, a Danish investigation in 1969[1] indicated that one could reasonably assume that the social and economic consequences of road accidents amounted to approximately 1% of the national product.

1.1.2. Human suffering

In addition to the direct or more indirect economic losses resulting from road accidents, there are other negative factors which underline the gravity of the problem. Every year the health of a very large number of people is adversely affected as a result of their own involvement, or that of their close relatives or friends, in road accidents. Suffering, disablement and grief are hardly possible to evaluate, but they are obviously important elements to be taken into account in any assessment of the problem of road accidents.

1. Finn Kamper Jørgensen: Trafikulykkernes samfundsmæssige omkostninger 1967-1969.

1.2. Action in the field of road accidents

To solve this problem, or at any rate to reduce it as much as possible, the first essential step is to recognize it as a fact of life.

1.2.1. Accident control

The primary solution is to control accidents, i.e. to prevent their occurrence. However, such a basic principle hardly provides an adequate basis for action, as the problem requires a more differentiated approach. Accidents differ greatly in their origins and also in their consequences, and since, as stated, it is the consequences which determine both the economic and non-economic factors which make road accidents a problem, one possible way of reducing the extent of the problem would be to concentrate on tackling the accidents with the most serious consequences. This can, of course, be done by attempting to eliminate the accidents altogether, but a partial solution can also be achieved by limiting their consequences, i.e. by reducing the gravity of the worst accidents, and therefore the scale of the problem.

1.2.2. Prevention of damage

The latter point, the reduction of the consequences of accidents, will not normally be construed as accident control proper, even when, as stated above, it would be possible to view it as such. Measures under this objective are therefore usually viewed as prevention of damage. A very considerable proportion of the economic losses and the entire non-economic cost of road accidents can be attributed to personal injuries, and the limitation of these is therefore by far the most important form of accident prevention; in some instances it may even lead to measures resulting in increased material damage. For instance, recent automobile design is intended to offer greater protection than formerly to the occupants of cars at the expense of greater material damage.

1.3. Means of reducing the number of road accidents

Before examining in detail the various possibilities of implementing measures for the prevention of accidents and damage, it is essential to specify the decision-making bodies which are in a position to implement them. In this connection, it is undoubtedly the authorities, partly directly through their own efforts and partly by influencing private organizations and individual road-users, that have the greatest opportunity and consequently also the greatest responsibility for the implementation of measures to combat road accidents.

1.3.1. Legislation

Legislation is one means of influencing accident and damage factors. To achieve their effect legislative measures can be aimed at individual road-users and may take the form of the issuing of regulations governing traffic operations and also the stipulation of training requirements for persons who wish to obtain a driving licence for motor vehicles. Legal requirements, including the stipulation of standards for vehicles approved for use in public traffic, may also be imposed on producers or importers.

As a general principle, legislation should only be applied to fields in which it is at least reasonably possible to ensure its observance; in other cases in which it is more difficult to measure the desired effect other methods of achieving the intended results must be considered.

1.3.2. Publicity

In certain instances where legislation would be inappropriate the objectives can be achieved by means of publicity. This may take the form of a general attempt to improve road conduct by trying to increase mutual respect among road-users, or it may be aimed at alerting them to specific traffic situations which are known to be particularly hazardous.

Moreover, publicity campaigns of the latter type often form part of an overall programme of legislation and publicity, the latter focussing and underlining the crucial point of a specific item of legislation. It is also designed to disseminate the information more cogently than is possible in the wording of actual legislation which must be of a legal type for use by the courts.

1.3.3. Measures relating to roads

A common feature of legislation and publicity is the wide geographic area of its application which normally extends to the whole national territory. Consequently, measures in these fields must be based on an assessment of the overall situation. This may mean that insufficient attention is devoted to particular local problems relating to roads and localities which for one reason or another constitute a special danger spot on the road network.

It is therefore important to ensure that in such instances measures relating to the road system, for example the modification of road markings, traffic diversions and also even the design of roads, can be taken at local level.

1.3.4. Rescue Services

As stated in the introduction, an accident may be defined in terms of its consequences, and it is therefore important to attempt to reduce as far as possible injuries attributable to incorrect treatment or to the time lag between accidents and the treatment of injured persons. This problem lies in part in the ability of the first person on the scene to take the appropriate action in a given situation. This is really a problem of the population's familiarity with and use of basic first aid.

In addition, the efficiency of the more organised rescue services is of course of crucial importance for reducing accident injuries.

1.4. Preconditions for the successful application of accident prevention measures

One condition must be fulfilled before it is possible to apply the methods suggested in Paragraph 1.3. for preventing traffic accidents in such a way as to obtain optimum results with the resources employed. The decision-making bodies must have a clear idea of the effect of the intended action.

1.4.1. Anticipated effect

If we are to make a realistic forecast of the results of measures intended to counter the factors involved in road accidents, it must primarily be based on the identification of the main factors causing accidents and their effects. It is also important to have a realistic assessment of the significance of the individual factors and for this it is essential to understand their interrelationship.

1.4.2. Research

In dealing with problems of such scope and complexity rational decisions cannot be based exclusively on intuition and considerations of common sense. If real improvements are to be made in the field of road safety there must be constant investigation and research into this complex of questions to ensure that the most reliable basis possible is provided for the knowledge required for effective accident control, as otherwise there will of course always be a degree of uncertainty over the possible outcome of road safety measures. In connection with the last point, it is also important that the results should be closely monitored. Similarly, it is an important task of research to investigate the possible effects of changes in factors deriving from other areas of society, but which might possibly have repercussions on road safety.

1.4.3. Data and statistics

The generally accepted method of research on road accident problems is to study the assembled data. Classification of information obtained on road accidents is therefore a basic element in the research. Thus, effective road accident control must be accompanied by a continuous process of organised and systematic acquisition and processing of data on accidents, i.e. road accident statistics must be worked out.

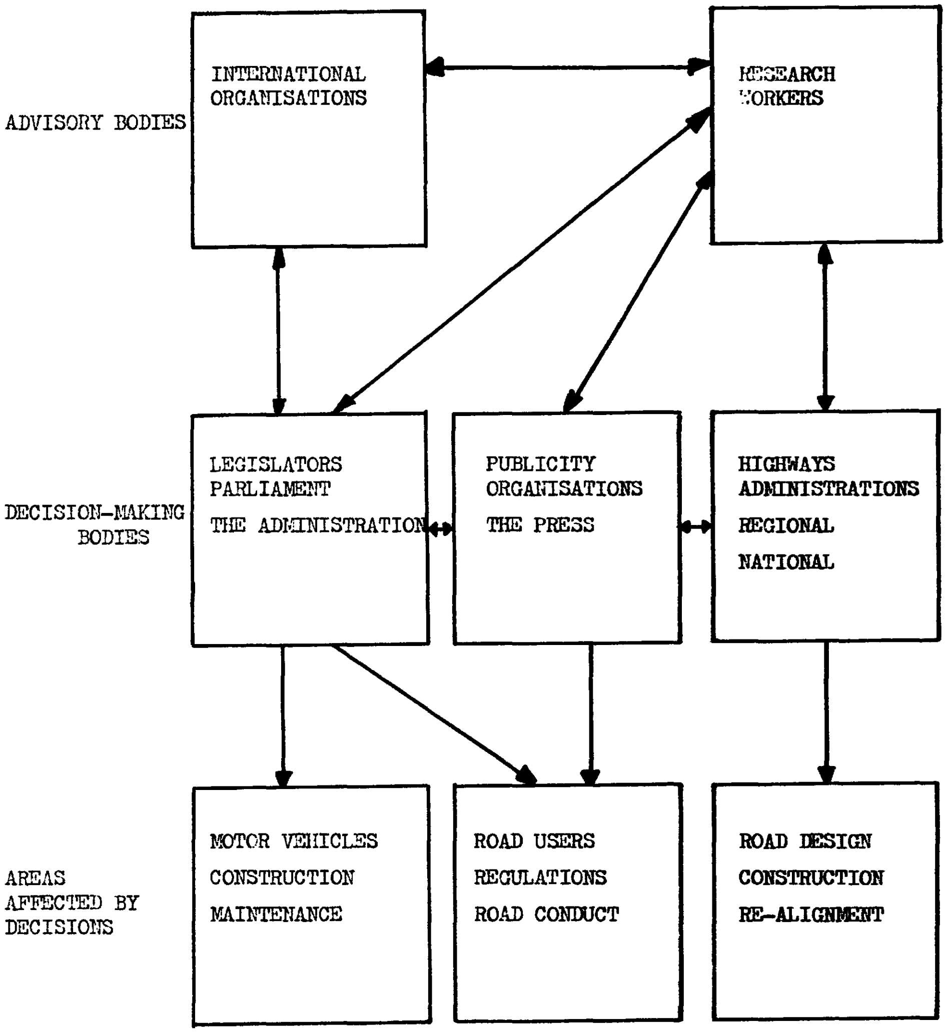
This report deals with the detailed subject matter of the statistics, the methods of preparing the surveys and the possible applications of this material, with particular reference to clarifying the need for international cooperation.

1.5. Users and objectives of statistics

To complete this general background to road accident statistics it would be appropriate to mention some of the main categories of users and their objectives in using the statistics, since these user-categories ought to have an appreciable influence on determining the type of statistics processed. A more theoretical discussion of the adjustment that is necessary to ensure that the different interest groups are considered when preparing statistical surveys is given in Annex 1, item 1. Paragraph 1.3. establishes that there are three principal groups of decision-making bodies, whose activity is concerned with three further main groups of factors related to accidents. These groups and their interrelationship are shown diagrammatically in figure. The diagram also indicates possible ways of linking an international body to a national system. The most obvious consequence is the possibility of establishing uniform legislation with beneficial results for the two areas of activity with which national legislation is concerned.

As far as the road-users are concerned, it is particularly important in view of the increase in all forms of international road traffic, that

FIGURE 1. AREAS AFFECTED BY DECISIONS AND DECISION-MAKING BODIES IN THE FIELD OF ACCIDENT CONTROL



traffic regulations do not change in any major respect when a frontier is crossed. In critical situations most people react by reflex in accordance with a familiar set of regulations; this can be disastrous if everyone else automatically reacts to a different set of regulations. Sweden's switch to driving on the right is probably one of the most comprehensive national legislative measures taken exclusively for international reasons.

The construction of motor vehicles is characterised by the fact that the manufacturers are often multi-national companies. At all events, they are normally very large concerns operating on the world market on such a scale that it can be difficult, particularly for small nations with no independent motor-car production, to persuade them to produce vehicles which comply with specific regulations. However, the economic impact of international pressure from several countries, possibly including the manufacturers' own countries, can often be such as to ensure fulfillment of differing requirements. The USA's requirements for safety equipment in motor cars are an example of a major market's influence on motor-car production throughout the world. As a result of these, the safety equipment of a large proportion of new cars has been increased, and this fact was then used as an important sales point for the vehicles.

Road accident research, like research in most other fields, is traditionally characterised by international exchange of experience. A number of international journals and organizations, of which in the European context the ECE and OECD deserve special mention, have a useful role as intermediaries in this exchange of information. One of the most conspicuous results of this type of international cooperation is the spread of the compulsory use of seat belts in motor cars. The first trial was conducted in Australia and the results have led a number of countries to introduce or consider the introduction of a regulation relating to the compulsory use of seat belts.

2. STATISTICAL SYSTEMS

A statistical system comprises the following elements: the acquisition, transmission and processing of data, and the preparation of results in such a form that they are of value to users.

A general survey of the contents of the statistics, i.e. a broad breakdown of the types of factors included in the systems, is the most suitable basis for reviewing the scope and degree of detail of the different statistical systems. In addition, to obtain a more detailed review of the interrelationships between statistical systems, it is essential to distinguish the main data-collecting bodies.

2.1. Principal groups of factors

Before attempting to relate the numerous factors that may be of significance in connection with road accidents, it is desirable to be able to classify these factors in certain principal groups. The starting point for a breakdown of all relevant factors into three principal groups is provided by the ECE's definition of road accidents, viz. that every accident involves at least one person and one motor vehicle.

2.1.1. General accident factors

The characteristic feature of the factors designated as general accident factors is that they can only be assigned one value which remains constant for all the units or persons involved in the accident.

Examples of general accident factors include the time of the accident, weather, and the scene of the accident, and also the consequences which determine the gravity of the accident, e.g. whether it is a fatal accident, an accident involving personal injury or one involving material damage.

2.1.2. Unit factors

In contrast to the general accident factors which appear as one fixed set of variables per accident there are as many sets of values of unit factors as there are units involved in the accident, since the term units includes motor vehicles and pedestrians, and also animals and fixed objects outside the vehicles. As each set of variables relating to the unit factors pertains to only one unit, this set is then constant for all the persons associated with the unit concerned.

The unit factors include the type of unit, the relevant traffic regulations for the unit, its technical condition and speed at the time of the accident.

2.1.3. Human factors

After breaking down the accident into all its constituent units the next step in grouping the factors is to break down the units into persons. The human factors refer, of course, to each individual involved and therefore, in those cases where there is only one person in a given unit, as is always the case for pedestrians, they supplement the variables relating to the unit factors. However, the human factors are subordinate to the unit factors and must therefore in all cases be presented as a separate group including age, sex, use of crash helmet or safety belt and also the diagnosis of the injury.

The interrelationship between these three principal groups of factors is illustrated diagrammatically in Annex I, figure 3.

2.2. Principal groups of data-collecting bodies

One of the basic reasons why it can be expedient to use different statistical systems is that it may be necessary to use several groups of data-collecting bodies. This will normally apply in the case of the acquisition of data relating to incidents of such a complex nature that it is impossible for any one observer to posess sufficient expert knowledge to give a detailed description of all the relevant factors. In such cases, which undoubtedly include road accidents, the classification of the different data-collecting bodies can provide the basis for a breakdown of the statistics.

2.2.1. Police

Police reports have traditionally provided the principal source for almost all road accident statistics. There are two reasons for considering the police to be those best suited for communicating information on road accidents. Firstly, the police are called out to a very great number of accidents and secondly, it is the task of the police to report to the judiciary on the nature of accidents on the basis of their on-the-spot observations and statements from those involved and from any witnesses. Since, therefore, the work of the police already involves the acquisition of data, it is natural to endeavour to incorporate these data into a statistical system. In addition, the traffic experience of the police obviously permits more qualified reporting on a range of traffic factors than could be obtained from other observers.

2.2.2. Rescue services

Besides the police, the rescue services are also present at the scene of many accidents in the exercise of their duties. However, since the police are normally always present at the scene of accidents to which ambulances are called, and in view of the fact that the rescue team is concerned with providing the injured with medical care as quickly as possible, i.e. away from the scene, it is both superfluous and inappropriate for the rescue services to give a report.

There is one area in which rescue workers are obviously better qualified than the police to record relevant information, i.e. the nature of any personal injuries involved. However, since the injured persons are transferred from the rescue services to doctors, who have better specialist qualifications and also more time for examining the injured, it also seems inappropriate in this area to use the rescue services as a data-collecting body.

2.2.3. Insurance companies

Insurance companies dealing in motor vehicle insurance become acquainted with many accidents in which their policy holders have caused damage or have themselves sustained personal injury or damage to their vehicles.

Insurance companies are however in the main obliged to work with second-hand information, e.g. information based on reports from the police, policy holders or doctors. For statistical purposes these sources are either unreliable or else they can be used directly without the insurance companies acting as intermediaries. In other words, the insurance companies are unnecessary intermediate sources which moreover hamper uniform processing because of differences between the companies' records systems.

2.2.4. Vehicle inspectors

The investigation of the mechanical condition of vehicles involved in accidents - one of the possible contributory unit factors - must be a matter for highly trained experts.

The police has, of course, the opportunity to detect whether there is any evidence of mechanical defects as a contributory cause. However, a more exacting mechanical examination must be left to technical expertise which in Denmark is provided under 'Statens Bilinspektion' (Government Motor Vehicle Inspectorate). This body controls a nationwide network of inspection centres to which the vehicles involved can be brought for detailed inspection as to their mechanical condition.

2.2.5. Hospitals, doctors

What is true of vehicles, applies also to the injured, i.e. a diagnosis can only be given by a skilled expert, immediately a slightly more detailed description is needed, rather than a broad breakdown of injuries into a few main categories. The police can supply the latter, but a proper assessment of the seriousness of the injuries and their short or long-term repercussions can only be made with medical assistance.

2.3. Principal categories of statistical systems

In preparing statistics on very complex situations, it is almost always recognized that it is inapposite to use a single statistical survey as a common denominator of all users.

The greater the scope of the problem which is to be elucidated by means of statistical material, the greater the number of specialists involved in the search for a solution. But to find a solution various specialists may often have to tackle specific aspects of the problem separately, thereby creating the need for detailed statistics for each of a series of sub-areas of the overall complex of problems. "Area" in this context means a group of factors, the complexity of which is determined by the number of values that can be ascribed to each individual factor. However, each specialist group only requires a high degree of detail for its own area and much less detailed information for other areas. Accordingly, there is no need for all the statistical requirements of the users to be met by one statistical survey which, if that were the case, would have to satisfy all the requirements for details from the various user-categories.

This, of course, does not imply the exclusion of possible attempts to meet the requirements for statistical surveys by preparing a single overall survey. However, experience shows that it is generally unwise to make the statistics any more specific than is absolutely necessary, as thus often results in two considerable drawbacks. Firstly, a comprehensive statistical survey requires a more elaborate system of statistical processing than a simpler one. This increases the risk of error and also inevitably results in such a protracted processing period that in many cases the value of the statistics is obviously greatly reduced because they are no longer topical. The second major drawback of overall surveys which are to be used by several user-categories is the undue expense entailed. This is primarily because the statistics invariably include a wealth of information which is very costly to prepare, but which no-one requires.

One of the basic factors to be considered when establishing criteria for the breakdown of accident statistics into principal categories, must be the organisational criteria of the decision-making bodies. In connection with this problem, which was mentioned above, grouping on the basis of sections of the Administration would provide a suitable basic subdivision of systems of accident statistics.

2.3.1. Regional accident statistics

It should be emphasized at the outset that the terms "regional level" or "local level" in this report simply designate a subnational unit and do not imply detailed study of the importance of the various regional levels that exist in nearly all countries.

A description of systems of accident statistics must start from the fact that the primary assembly of data must largely take place at regional level, because, as previously stated, it is normally a condition of sound data recording that the observer should be present at the scene of the accident or else at the place to which the persons and vehicles involved are subsequently taken.

The advantage of regional surveys is that these statistics can include local details which in larger systems do not readily offer any advantage but which at local level are often of great importance in considering planning of accident control measures. The principal reason for this is, of course, that decisions taken locally mainly deal with road design and marking, etc. which only affect local accident spots. In such cases, analyses of more standardized statistical information in themselves are of less relevance than examination of the accident spot concerned. However, local analysis by itself is seldom sufficient to solve the problem, since the number of accidents is often too limited to permit determination of the individual importance of the accident factors and it is therefore expedient, in addition to local, detailed information, to have facilities for comparison with a greater wealth of background material.

2.3.2. National accident statistics

As stated above, the regional decision-making bodies need to be able to supplement local detailed analysis with information on general trends for specific accident factors which have been worked out following standardized classification of a larger corpus of data.

Although national statistics therefore can be used in the decision process at local level, it must be said that their main objective is to ensure that surveys at national level should be available for use by decision-making bodies and other users at this level.

It follows that national statistical systems do not need to have the same degree of detail as regional systems are obliged to possess on some points. This agrees with the view mentioned earlier, i.e. that the greater the field covered by a statistical survey, the less detail it ought to contain if it is to be of any practical use.

2.3.3. International accident statistics

Just as national statistics provide a framework of reference for decisions at the lower, regional level but also at national level, statistical surveys of the international type can assist deliberations at national level at the same time as providing the basis for international measures which in any case normally have to be implemented through the medium of the national decision-making bodies. (Cf. figure 1). One might state that the principal objective of international statistics up to now has been to provide the background material for national actions.

2.3.4. Summary

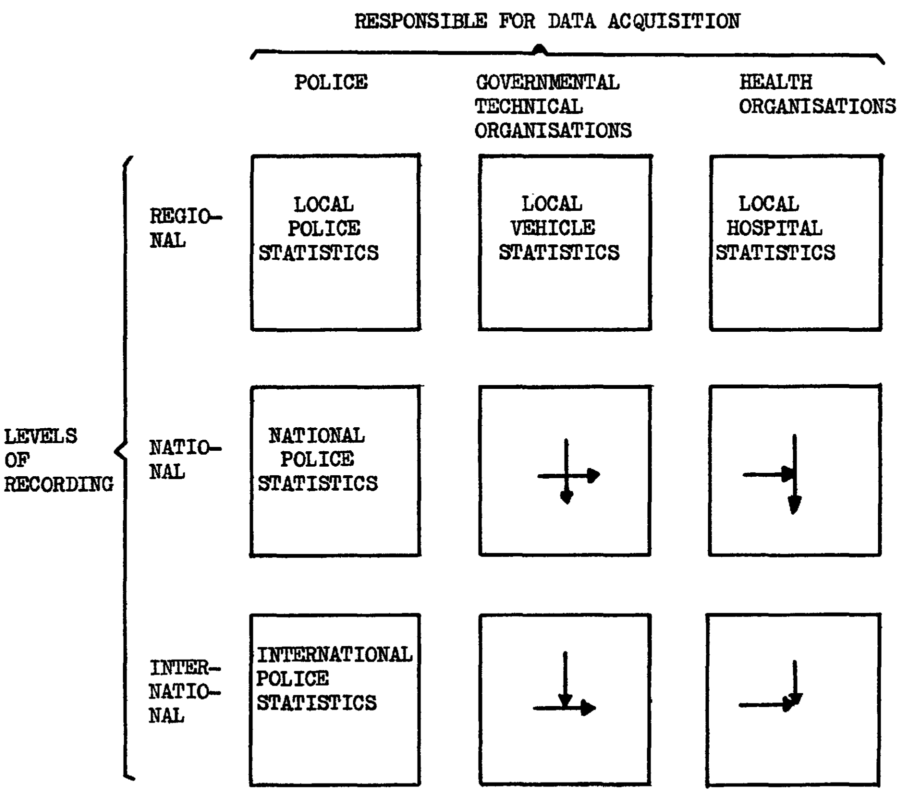
The above section has shown that an appropriate classification of statistical systems may be made on the basis of two criteria.

The first is determined by the demands made on those responsible for data assembly. The need to clarify the circumstances of accidents, the mechanical condition of motor vehicles and diagnosis of the trauma of the injured have led to the selection of experts in the field of accidents, motor vehicle technology and medicine as three principal categories of persons concerned with data acquisition.

The users' areas of responsibility are the second criterion. In some instances these coincide with the classification determined on the basis of those responsible for data acquisition, but the areas affected by decisions can also be determined by a breakdown into administrative units.

On this basis no fewer than nine statistical systems can be identified: police statistics, statistics on the mechanical condition of vehicles, medical statistics, at each of three levels: regional, national and international, cf. figure 2.

FIGURE 2. FORMALIZED STRUCTURE OF THE SYSTEMS FOR RECORDING DATA ON ROAD ACCIDENTS



3. COORDINATION OF FACTORS

As shown in the preceding section, there are many arguments for using a variety of statistical systems, but this would entail the complete or partial collation of these systems.

There are two reasons for this. Firstly, the data for different grounds of factors then come from different sources, and a user, who requires information on factors emanating from different data-assembling bodies, has to be able to link the statistical systems containing the relevant factors, to obtain a single file containing at least the information which he needs.

Secondly, this would lead to a more rational method of recording the data, which is common to the systems involved. Although all redundancy is not always entirely undesirable, it is clear that any considerable overlap between several data acquisition systems may lead to excessive duplication which could be avoided by effective coordination.

3.1. Coordination methods

As several objectives can be served by coordinating statistical systems, it is important that a decision on the coordination method to be used in a specific case should only be taken after consideration of the two basic procedures for data coordination, which follow from the parallel and the sequential methods of data acquisition. These two methods are not mutually exclusive and can be combined in various ways.

3.1.1. Parallel data acquisition

As the term implies, the parallel method of data acquisition is based on several data flows which are accumulated parallel to one another. The validity of this approach should be clear from section 2.2. which refers specifically to the need for several different groups of data-collectors.

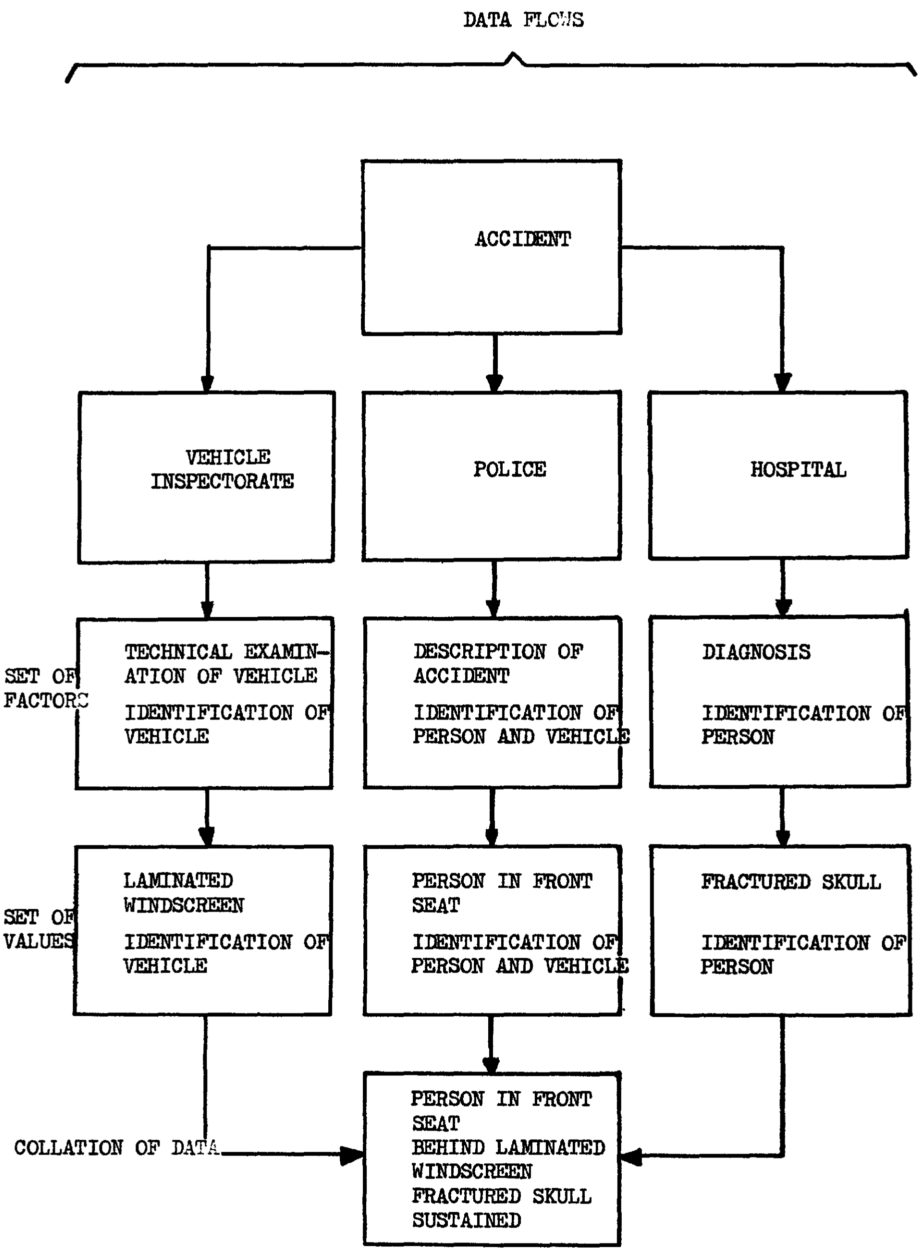
The crucial element for linking these parallel data flows is the matching key. In order to permit the linking of the variables in the different sets of factors, each set of variables in each data flow must be accompanied by a key identifying the original incident to which they refer. By using this key it is thus possible to link the different variables from the same incident but from different sources.

Figure 3 gives an example of the parallel method of data acquisition in diagrammatic form. It shows that the original incident is a road accident from which three data flows emanate; one of these relates to vehicular factors, the second deals with personal injuries and the remaining factors are grouped under "description of accident". In the first data flow that relating to vehicular factors, each vehicle is identified by a number which may, for instance, be the vehicle's registration number. Among the set of values obtained from the examination of the relevant set of technical factors may, for instance, be that a vehicle has a laminated windscreen.

Similarly, the data flow relating to personal injuries can identify each injured individual, for instance by using an official numbering system for persons, and, at the same time, specifying the nature of the injury.

If one wished to link the two systems relating to the vehicle's technical condition and to personal injuries in order to investigate, for instance, the relationship between laminated windscreens in cars and fractures of the skull among drivers or front-seat passengers, these two data flows would be linked to the third, which includes information on the injured person's position in the vehicle, by means of the two identification numbers.

FIGURE 3. PARALLEL ACQUISITION OF DATA ON ROAD ACCIDENTS



It can be seen that there are advantages in using a parallel system for recording very complex incidents which call for a great range of expertise.

3.1.2. Sequential data acquisition

Unlike the parallel method, the sequential method of data acquisition is based on the principle that data should be assembled in a single data flow at the point of acquisition, resulting in the building up of a single data base in which all the information obtained is stored.

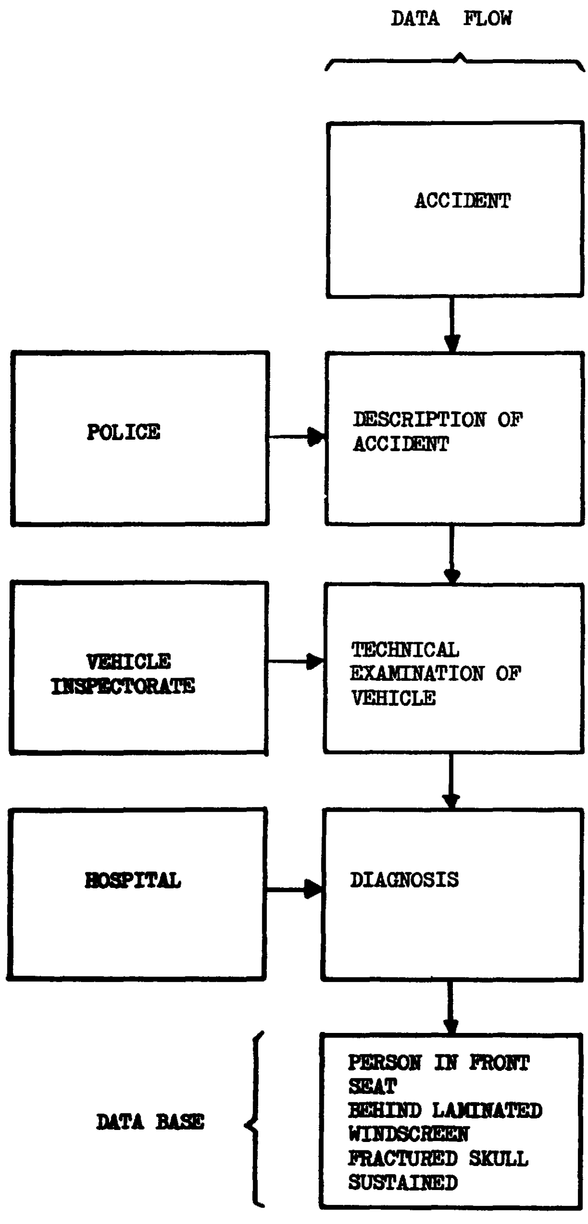
Even if such a system is obviously inconsistent with the view expressed above in section 2.3. (viz. that it would be inapposite to use a single statistical system in dealing with phenomena as complex as road accidents), one cannot, a priori, rule out the possibility that the system could profitably be used for specific parts of the recording process.

The central feature of the sequential system is the medium used for recording data, which is normally a conventional report form. (There is no objection in principle to the use of, for instance, punched cards or even magnetic tape, but, transcription to such storage media will normally not occur until late in the acquisition stage).

Figure 4 shows how the sequential method can be used to process the same data as were collated by using the parallel method, illustrated in figure 3. It also shows that it would be possible to conduct the intended study of the relationship between laminated screens and skull fractures. However, this has necessitated the building up of a comprehensive data base which may cause a number of problems of communication and which also means that the recorded data will not be available for use until a later date.

A further adverse effect of the time spent on recording is that in a system such as that shown in Figure 4, the injuries cannot be recorded until the description of the accident and also the technical examination of the vehicle have been completed and recorded.

FIGURE 4. SEQUENTIAL ACQUISITION OF DATA ON ROAD ACCIDENTS



Conversely, the data recorded first cannot be used until all the other data are recorded in the data base.

It is therefore clear that a system of sequential data acquisition can only be applied to incidents involving a small quantity of data which can be assembled by one or, at the most, a few data collectors. The difficulties are particularly great where there is also a time-lag between the recording of the different data.

3.1.3. Combination of the parallel and sequential methods

For general statistical purposes it may be expedient to have available a less detailed data base than that provided by the sequential method. Moreover, a reduced data base of this type acts as a sort of supplement to the statistical systems of the various specialist groups; these systems have considerable detail for each variable, but are limited in terms of the number of factors covered.

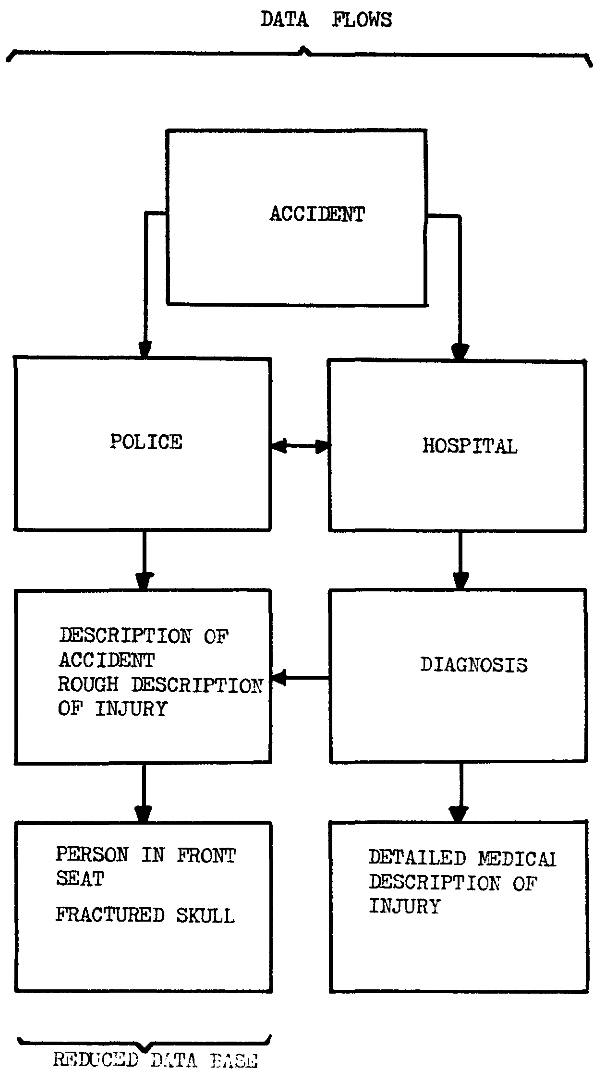
A combined system of this type normally consists of several systems built up parallel to one another and are linked at certain specific stages.

Figure 5 shows the system which is probably most widespread for reporting on road accidents. Two parallel data flows originating from the accident are shown. Data acquisition in one of these is by the police, and in the other by the hospital sector. When the police have collected the data describing the accident, these are then collated with the hospital system. This produces some broad categories of injury for subsequent inclusion in the data flow relating to the description of the accident, whereas the hospital system, which goes into greater detail with regard to personal injuries, is developed further on its own.

3.2. Coordination levels

The level at which coordination should take place must be determined not only on the basis of the above-mentioned data flows, but also on information on factors relating to the accident which is obtainable from

FIGURE 5. COMBINED PARALLEL AND SEQUENTIAL ACQUISITION OF DATA ON ROAD ACCIDENTS



registers. The registers in question may contain information on roads, vehicles or persons, which means that it would be conceivable to use the information from them for each of the three principal groups of factors relevant to road accidents, viz. general accident factors, unit factors and human factors, cf. section 2.1. The existing register structure is therefore important for assessing the need for coordination at regional, national and international level.

3.2.1. Regional coordination

Regional coordination, of which Figure 6 gives an example, is a reflection of the collation of different sets of factors at local level.

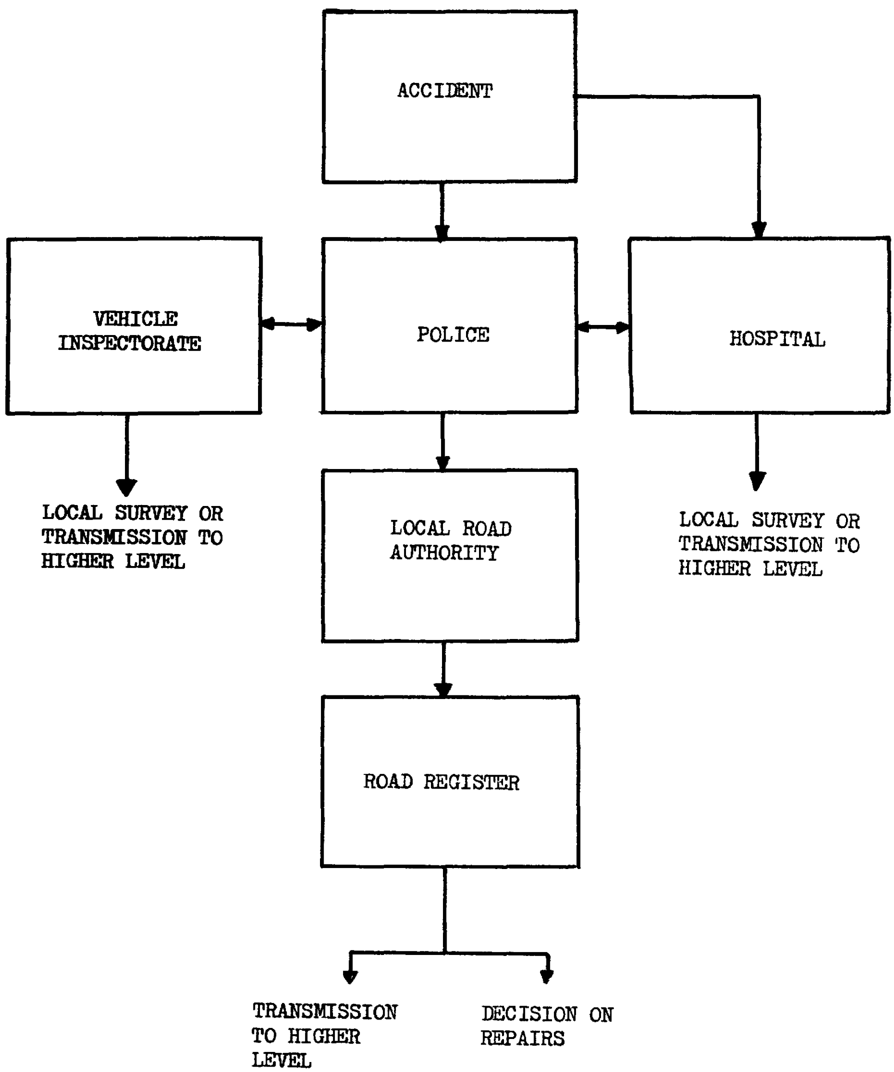
The three statistical systems previously referred to, which take as their starting points data acquisition by the police, vehicle technicians and medical experts respectively, are built up on the basis of actual accidents.

A normal feature of regional coordination is that the police supply the information collected at the scene of the accident supplemented by information from the hospitals treating the injured on the nature and severity of the injury. On the other hand, the police may supply information to the hospitals that may help to clarify particular circumstances which are possibly relevant to specific types of injury.

However, the hospitals' function with regard to data acquisition will not as a rule be regionally determined, since it seems hardly feasible that there should be any very common factors of regional origin likely to affect the consequences of road accidents as far as concerns injured persons.

A further standard procedure at local level is that the police forward to the vehicle technicians information on the detailed circumstances of an accident, so that it is possible in the course of the technical examination to assess whether vehicle defects were contributory factors, cf. the almost classic example of the braking performance of a worn tyre being excellent on a dry road surface but totally inadequate on a wet one.

FIGURE 6. REGIONAL COORDINATION OF DATA ON ROAD ACCIDENTS



The results of the technical examination of vehicles are subject to only limited regional importance, but it is nevertheless important that they should be coordinated with the data assembled by the police, since these may then be forwarded to the local road authority. Annex I, point 5.2. and Supplement 1 give a practical example of this sequential coordination between the police and the road authority.

This authority is a local decision-making body which is able to implement measures designed to improve road safety at accident black spots on the basis of information relating to the sequence of events and on a precise description of the scene of an accident. In this connection, the compilation of local road registers incorporating a locality code as a key would be profitable since it would then be possible by means of a locality code for the accident to link a range of road factors, for instance, surface, longitudinal and cross' sections and also different types of road markings, with the information obtained by the police on the values for the remaining factors relating to the accident.

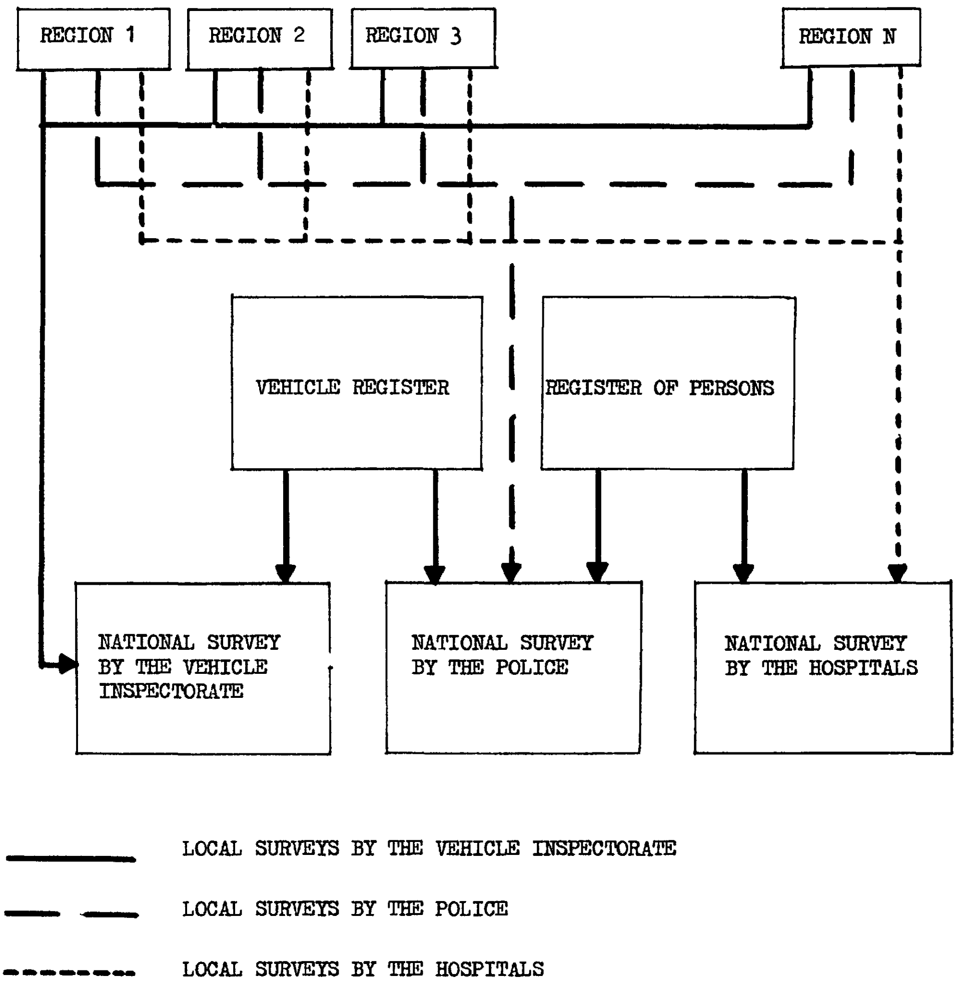
In certain exceptional cases, where individual regions are to be studied under research projects, coordination is often much more intense.

3.2.2. National coordination

As shown above, there are as a rule three systems of information emanating from regional level that deal with different areas relevant to road accidents. National coordination consists primarily in collating all these tripartite data flows into three statistical surveys with matching data bases, cf. Figure 7.

This may appear straightforward, but it can only be achieved if all the regions work with the same combination of factors and the same scales of values for each of the three statistical systems, at least in so far as concerns the information to be transmitted to national level. This re-

FIGURE 7. NATIONAL COORDINATION OF DATA ON ROAD ACCIDENTS



quirement alone implies that the national authorities will exert considerable pressure on the regional units to ensure that all of them follow the same system and use comparable sets of factors and values. This also paves the way for one of the possibilities offered by national coordination, i.e. the possibility of using individual regions as quasi test districts for research projects, following which the results obtained can be extended throughout the country concerned by means of the coordinated national system.

National coordination similar to that mentioned in the previous section at regional level in which the statistical systems are linked to one another or to registers, e.g. a vehicle register or central registers of persons, is theoretically possible provided the identification key is always included in the data bases.

However, in Denmark, where this has been possible for some years, it has been shown that the need for centralized collation of accident statistics has not been so great as to warrant serious attempts to set up a standing collation procedure. This is probably an indication that the regional coordination between the three data flows is in fact so effective that the improvements that are sought at national level can be achieved through greater regional coordination.

It should, however, be added that ad hoc investigations at a national level have shown that such coordination of data streams may be hampered by the lack of sufficient established procedures for such coordination.

3.2.3. International coordination

Coordination at international level is generally based on collation of the statistics produced by separate national systems or, at the most, of limited extracts of the full data. For instance, the ECE and CEMT collect annual data based on national police-prepared statistics in conjunction with national population statistics and with national statistics from registers of the numbers of motor vehicles.

Similarly, information on fatal accidents is assembled by the WHO from national surveys in which an internationally agreed classification of causes is employed.

As far as is known, no international surveys dealing with the results of the technical examination of vehicles involved in accidents are at present being conducted.

It would appear rather unrealistic to envisage in the foreseeable future any real coordination at international level of the inputs to the system, of the separate sets of factors or the full data for individual accidents. In the first place, it is questionable whether such action would achieve its objective while there is still room for further coordination at national level. Moreover, the variations between countries, for instance, with regard to identification number systems, internal coordination, etc., preclude a meaningful international coordination process of the raw data describing individual accidents. Such collation is best carried out at regional or national level.

At international level one is therefore limited to the use of output of, or extracts from the statistical systems, established at national level, and cannot have merged files of the full data for individual accidents. The coordination problem is however analogous to that entailed by the national coordination of the regional systems. Since the regional surveys in most countries have been assigned a relatively clearly defined role as a kind of sub-contractor to the national systems, one of the major tasks in connection with international systems is thus to work out a coordination process helping towards greater standardization of national, and by implication also of regional, systems in order to have internationally comparable outputs.

By way of clarification of the importance of international surveys as outlined in Figure 1, Figures 8 and 9 show the two main objectives which may be realized by using internationally coordinated statistical systems.

Figure 8 shows a traditionally structured international statistical system. The final element consists in international coordination of national

FIGURE 8. INTERNATIONAL COORDINATION OF DATA ON ROAD ACCIDENTS I.

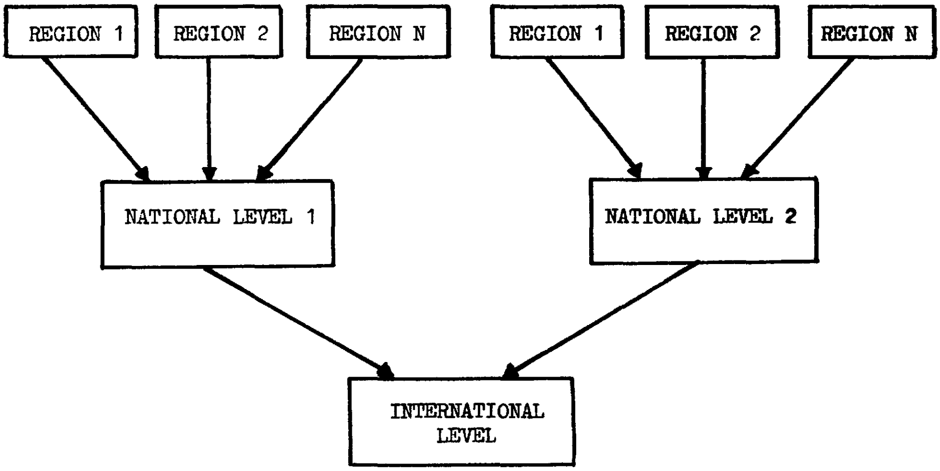
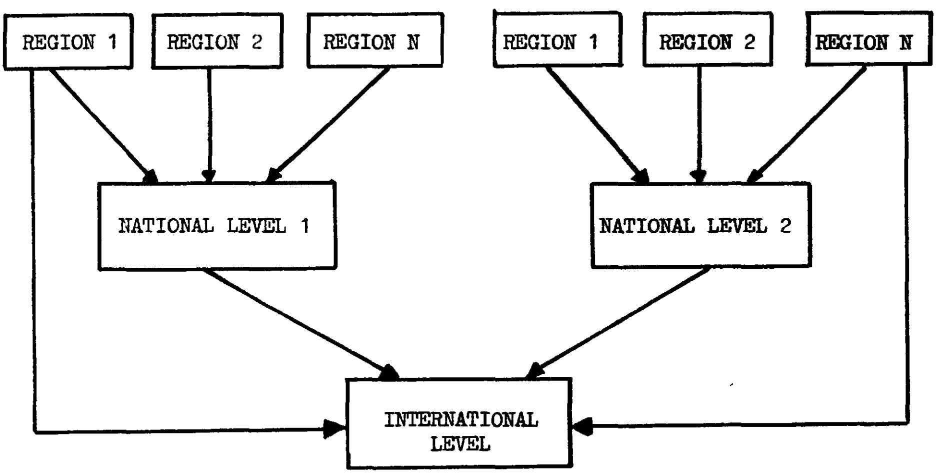


FIGURE 9. INTERNATIONAL COORDINATION OF DATA ON ROAD ACCIDENTS II.



systems. Variations between the latter will in themselves cause a considerable reduction of the degree of detail in the categories which can be used in international system. Accordingly, the primary task of coordination at international level is to ensure that the international surveys are sufficiently detailed to permit clarification of combinations of factors which occur to seldom that it would be very difficult to draw any conclusions from the small number of cases that could be investigated by referring exclusively to national material. The preparation of relevant international statistics therefore largely depends on sufficient standardization of the underlying national systems for defining the variables to allow the preparation of partially aggregated figures, which may not be meaningful nationally, but which can be amalgamated with data from other countries to derive meaningful statistics, based on the whole group of countries.

Figure 9 illustrates another important objective of international statistical systems. By means of such surveys it should be possible to conduct joint research projects. For instance, it is conceivable that a particular region might be exceptional in relation to the other regions in its national system, but might, in the wider international context, correspond to regions in other countries. There would probably be advantages in being able to examine the particular accident problems of mountainous regions on an international basis. Moreover, the previously mentioned possibility of selecting particular regions as test districts for special research projects is also valid at international level. Provided there is sufficient international coordination, such test districts could ideally be situated in different countries and the work could consequently be shared. The risk of the duplication of effort could be reduced by taking account of each country's independent projects.

4. FACTORS WITH INTERNATIONAL SIGNIFICANCE

Against the background of the national statistical systems outlined in the previous sections, an attempt will now be made to clarify which of the factors embodied in these systems it will be appropriate to introduce into one, or several international statistical systems.

Although, as stated previously, there is always some unexplored potential for linking the various statistical systems on a national level, that cannot be considered here a sufficient reason for suggesting a similar course of action on an international level. Only those factors will be reviewed here which can be seen to be of international significance, in the specific system in which they are embodied.

4.1. Vehicle inspection statistics

Vehicle factors include the technical specifications covering vehicles. From both the design and servicing points of view these factors are important in the context of road accidents.

4.1.1. Vehicle design

In the first place, it is the combined effect of a very appreciable proportion of the technical components that together make up a vehicle which determines the vehicle's behaviour on the road. An operational definition of this concept will take the form of an extensive compendium of technical specifications, e.g., braking distances, skidding limits and headlamp range. In an attempt to collate all the technical details into one all-embracing statement, the characteristics of the vehicle on the road could be related to the risk of its being involved in an accident in the following manner, namely, the better the characteristics of the vehicle on the road, the more hazardous the situations in which it will be able to survive with a given driver.

Secondly, the technical specifications governing a vehicle's design are of great importance in determining the extent of personal injuries sustained in the event of an accident, particularly of those injuries sustained inside the vehicle.

Despite the considerable importance of basic designs to road safety, it is quite pointless to think of this information being uncovered by international statistics, because a single piece of information, on the make and model involved, can provide a key to the whole of the technical factors in the design.

The design of vehicle components is a much more appropriate subject for research on models and laboratory investigations than it is for a statistical system of the kind being discussed here.

4.1.2. Vehicle servicing

Vehicle design is still, in so far as servicing is concerned, a subject for statistical study, because vehicle condition at the moment of accident can be significant with regard to the origin and consequences of the accident. Information gathered on vehicle factors, such as the actual state of the engineering components can therefore be useful. (c.f. Section 2.2.4.).

The value of international records of vehicle factors in the foregoing sense will be that, in the light of statistical data from different regions where divergent regulations on vehicle servicing apply and where the age distributions of the vehicles in use may differ, attention will possibly be drawn to the main variables concerning vehicles, which are usually, or sometimes, like vehicle age, not in a satisfactory state.

Since the objective of international logging of information on vehicle factors is to identify any possible problems, the solving of which will require additional and more intensive investigations, a grouping of vehicle-technical factors under a few main headings will suffice for the first attempt to achieve this objective. For example, such a grouping of factors could be:

1. Braking system
2. Steering gear
3. Lighting and light signalling devices
4. Tyres
5. Passive safety equipment
6. Miscellaneous equipment
7. Vehicle type

Values assigned to each of the categories 1-6 could, for example, be:

1. No fault
2. Fault (but no connection with the accident)
3. Fault (with a connection to the accident)

While the categories covering the vehicle-type factor might be:

1. Private motor car
2. Light goods vehicle (3000 kg gross weight)
3. Heavy goods vehicle (3000 kg gross weight)
4. Public service vehicle
5. Motorcycle
6. Mopeds, etc.
7. Other

4.2. Hospital statistics

All road accident data which doctors and hospitals are required to record concern the human factors relating to the accidents. In addition to corroborating police statements about the influence of alcohol, the medical job at the scene of the accident consists of diagnosing the injuries, assessing the causes of the injuries and their effects in the short and the longer term.

Random information on any of these three factors can scarcely be regarded as significant on an international level, even if it could naturally be important in itself and perhaps be used for propaganda purposes e.g., for pointing out that so and so many bone fractures in the EEC in a particular period of time are the result of road accidents, or that a certain number of hospital-days could be attributed to injuries caused by road accidents.

The significance of the international recording of the factors in question still lies in the correlation of these factors. Particularly important from this standpoint will be the relationship between the causes of accidents and their after-effects, because some of the causes may be of such a kind as to call for measures for their repression to be adopted at an international level. Even if, for the purpose of identifying this problem, the injury report is theoretically superfluous, the information it contains can hardly be omitted from an international system, since the injury report is reputedly the factor where the national variables have the greatest degree of harmonization. This factor will accordingly be the best one to use as the yardstick in assessing the correlations between cause and effect in the national data - a task which can naturally be done only if the injury report provides the essential connecting link.

In the light of such considerations, it would be possible to devise an international statement which sets out the factors of: cause of accident, injury report and injury after-effects expressed as the cost to the health service's resources and the significance of the injury in respect of the trade or occupation of the injured person. Consideration could be given to the following variables:

Cause of injury:

1. Being hurled against the steering wheel, fascia or windscreen
2. Injury inside the vehicle from a side-on collision

3. Injury inside the vehicle from a rear-end collision
4. Injury from vehicle being overturned
5. Ejection from the vehicle
6. Being knocked down by a two-wheeled vehicle
7. Being run over while on a two-wheeled vehicle or on foot
8. Other causes

Injury report	1. Cerebral concussion, fracture of the cranium, lesions of the face, lesions of the eyes 2. Lesions of the thorax and/or abdomen 3. Lesions of the spinal column and/or pelvis 4. Fracture/dislocation or severe strain in the shoulder, arm or hand 5. Fracture/dislocation or severe strain in the hip, leg or foot 6. Serious injury to several limbs 7. Burns 8. Slight injuries to tissues only
Injury after-effects	1. Cost to the health service (Number of hospital-days) 2. Time off work (Anticipated number of lost productive units of time)

4.3. Police statistics

As will have been apparent from the earlier sections (see, for example, Section 2.2.1.), police reports now play a decisive role in the compilation of road accident statistics and in connection with the results of the coordination efforts which can contribute in the future to the rational and effective use of road accident statistics.

It is also in this sphere that international cooperation has progressed most within the international organisations mentioned above. The results obtained there can still be advantageously supplemented or extended by information collected over smaller areas, including nations, which are to an appreciable extent comparable with regard to social progress, traffic structure, health services, etc., such that the value of more detailed information can be defended. The European Communities cover countries which are more like each other than does the ECE for example and this enables a more detailed combined record to be drawn up but, of course, there cannot be any question of one single large combined system rendering the national records unnecessary. Such a system would presuppose very much greater uniformity than now exists. The question therefore is, what proportion of the national police statistical systems can usefully be incorporated in an international system?

An analysis can most appropriately be carried out against the backdrop of the three main groups of factors referred to earlier, i.e. accident, component and human factors (see section 2.1).

4.3.1. Accident factors

An important accident factor is a specification of the scene of the accident in order to locate it beyond dispute. Normally it will always be possible to describe the scene of the accident in such a manner that the accident can be pinpointed in an ensuing investigation. Another aspect is that the systematic and rapid processing of fairly large numbers of reports presupposes a great amount of preliminary work on establishing reference points (bench marks), road surveys, preparation of maps, etc.

The associated problems are still irrelevant in this context, because an exact location of an accident can only be of importance to decision-makers who have the possibility of making changes at that place, i.e. to regional or national authorities.

In contrast, what may be of international importance in connection with the scene of the accident is the information about whether the accident occurred inside or outside a built-up area and, if possible, in what kind of built-up area. Usually, such information is not very difficult to obtain.

The time of the accident is another accident factor which is recorded almost automatically. This factor is internationally significant in the demarcation of periods. Even if the coordination of this factor has been arranged beforehand there is scarcely a need for more detailed reporting than on an annual basis.

Factors pertaining to the highways as such, e.g. type of surface, longitudinal and lateral profiles, width and surface markings will be of such a technical nature for most interested parties that information on them could not be obtained directly from observation at the scene of the accident. It must therefore be assumed that coordination would have to take place locally between the police report and the highway register containing this information, if it is to be possible to introduce these highway engineering factors into the national or international statistical systems. Corresponding coordination is likewise a condition for acquiring information on the traffic density at the scene of the accident.

But as the limit to the ambitions for international statistics is that the information must still be based on the existing national systems, it is therefore necessary to disregard these highway engineering factors as elements in the current statistical information on road accidents at international level.

In contrast to the, in the short-term, time-independent accident factors relating to the scene of the accident, which are primarily assessed via the use of the highway authority's registers, the assignment of values in accordance with the case must be the duty of the police in the case of the time-dependent accident factors.

The most significant among these accident factors which can therefore be incorporated into the police-based system is the accident situation.

The breakdown of road accidents into category of accident situation is so fundamental to the application of road accident statistics that it would be difficult to find a single, fairly detailed, international report which did not embody this factor in some way or other. In this connection, especially heavy stress ought to be laid upon the definition of this factor (see Annex I, section 5.4), whereas the breakdown of the categories can of course be restricted to specific main groups of accident types.

For the purposes of comparison with existing international road accident statistics it will be useful to employ a system of situation classifications similar to that used by the ECE, which uses the categories listed in Figure 10.

Apart from these accident situations, two other time-based aspects are important - visibility and road conditions. These two factors are to some degree interdependant as, for example, poor weather can reduce visibility and worsen road conditions. Another characteristic these factors have in common is that they are difficult to evaluate without advanced technological equipment and complicated measuring techniques which the police do not have at their disposal because of the considerable amount of time they would need for every accident. It is therefore necessary to base the information about the extent of these factors on estimates made by the police officer writing the report.

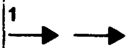
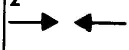
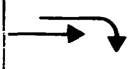
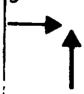
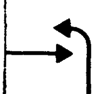
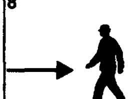
As the assessment cannot therefore fail to be influenced by some uncertainty, it would hardly be right for an international survey to divide up the two accident factors of visibility and road conditions, into more than the following two categories:

1. Normal
2. Poor, i.e., safety is considered to be reduced.

4.3.2. Unit factors

The most important unit factor is the type of unit which, unless an extremely high degree of specification is required, will only be difficult to assess in the case of vehicles which have driven away from the scene of the accident. As stated above, this is only possible when using recorded information so that the categories feasible are therefore restricted in the national surveys, and must consequently remain restricted in international systems.

FIGURE 10. ACCIDENT SITUATIONS

0 	Single-vehicle accident.	ECE GROUP
1 	Accident between vehicles travelling in a straight line in the same direction along the same road or street.	ECE GROUP
2 	Accident between vehicles travelling in a straight line in opposite directions along the same road or street.	
3 	Accident between vehicles travelling in the same direction along the same road or street at T-junctions, Y-junctions, crossroads or entries.	
4 	Accident between vehicles travelling in opposite directions along the same road or street at T-junctions, Y-junctions, crossroads or entries.	
5 	Accidents between vehicles travelling in a straight line across crossroads.	
6 	Accidents between vehicles on different streets or roads at T-junctions, Y-junctions, crossroads and entries or exits.	
7 	Accidents with parked vehicles.	ECE GROUP
8 	Accidents involving pedestrians.	ECE GROUP
9 	Accidents involving animals or objects on the carriageway.	ECE GROUP

It is therefore both important and possible to specify the main groups of unit types. The main groups of unit types are:

1. Motor vehicles
2. Cycles
3. Pedestrians

The motor vehicle category can be sub-divided into:

1.1. Private motor cars
1.2. Light goods vehicles (3000 kg gross weight)
1.3. Heavy goods vehicles (3000 kg gross weight)
1.4. Public service vehicles
1.5. Motor-cycles
1.6. Mopeds
1.7. Other

With its eight possible values the type of unit factor can present a fairly detailed picture of the involvement of the various road-user categories in road accidents.

As stated above, the type of road is a unit factor. In an international statistical system the values for this factor will often be put in order of decreasing importance and the first of which will be counted as the accident factor. In itself, this may be a sensible application of the statistics because the interpretation of type of road information at unit factor level serves hardly any purpose in an international context. The records should therefore take the form of unit factor values, as the factor terms will otherwise be differentiated in an ambiguous and uncertain manner. When determining the sets of values, account must therefore be taken of the aim behind this information and it will therefore be sufficient to use the following categories:

1. Motorway
2. More than two lanes
3. Two lanes
4. Other types of road

Traffic regulations form another unit factor which has hardly any international relevance. This is partly because traffic regulations are drawn up at national level and partly because road-users' attitudes to these regulations vary from country to country. The factor should not therefore be included in any international system.

Another unit factor of the type described is the speed of the vehicles at the time of the accident. It is extremely difficult to derive values for this factor. Interrogations of persons who have been involved in road accidents, or have witnessed them often reveal extraordinarily wide variations in their assessment of speeds. In some cases it will be possible to conduct technical tests at the scene of the accident on the vehicles involved so that the speeds can be assessed with some degree of reliability, but in by far the largest number of cases the report must be based on estimates. These estimates are however neither objective nor reliable, unlike those of visibility and road conditions where it is the police who conduct the estimate. The unreliability is due to the fact that chance witnesses cannot be expected to assess speeds with any acceptable degree of accuracy, and the lack of objectivity results from the fact that the information is often obtained from persons involved in the accident who are obviously intent on misleading the police when, for example, they have violated the law.

Unreliable information of this type should have no place in an international survey and, however interesting the information on speed may be, it should be omitted.

4.3.3. Human factors

The ECE survey of road accident statistics uses human factors as the main criteria for classification: (position and age;) and for purposes of comparison with this geographically more extensive survey, the EEC surveys must also include information about these factors. The values of the factors should be slightly more detailed than is the case with the ECE survey. It will therefore be expedient, in connection with the problem of safety belts or the seats to be occupied by children, for instance, for the persons involved not to be classified simply as driver or passenger as it is of considerable importance whether car passengers sit in the front or back seats.

As regards the age of persons involved in accidents, the figures are normally recorded to the year in the basic data so that it is possible when using this material to amalgamate data to whatever groups of years are needed for the survey in question. The same recording of data to the year (coded 00-99) should also be established in the international system.

In view of the considerable differences between the driving behaviour patterns of the two sexes, there should be an international survey enabling this factor to be taken into consideration, and the sex involved must therefore be entered into the report.

Information about whether the persons involved wore safety belts or crash helmets is a human factor in which interest will gradually wane as more and more countries make it compulsory to use these forms of protection. The need to include this factor in international road accident statistics must therefore be considered limited.

Another controversial human factor concerns the influence of stimulants, particularly alcohol. This factor is covered by the ECE survey but nonetheless its relevance in international surveys can be questioned. The problem is that assessment of this factor depends on an estimate conducted by the police, whose qualifications are not matched to this job. It is quite true to say that it is not the police who make the final assessment but it is the police who pick out the persons to be examined by a doctor and this choice will be partly arbitrary and partly influenced by varying national legislation, so that international systems based on data from several countries will be affected by various unknown biasses.

However, it cannot be denied that the effect of alcohol is a significant factor which might have to be taken into account when comparing accident statistics from areas with different attitudes to drunken driving, and this factor can therefore hardly be omitted from an international system of road accident statistics.

As in the case of age, the figures should be measurements on a scale which can be grouped into classes as required - in this case according to safety thresholds chosen. The scale must be that normally used, with the 0.1% unit steps distinguished.

Finally, it should be mentioned for the sake of completeness that injury is of course a human factor that cannot be ignored in an international survey. The categories can be taken over as they stand, from the ECE:

1. Death
2. Serious injury
3. Minor injury
4. Uninjured

4.3.4. Summary

Sections 4.3.1. - 4.3.3. show what accident, unit and human factors can be usefully included in an international system of road accident statistics. Furthermore, a framework has been erected for the categories which it will be appropriate to use.

The establishment of values will also be influenced by the choice of factors so that the following factors should be included in a system of police-based road accident statistics in the EEC:

Accident factors:

Time, Type of Area, Accident situation, Visibility, Road conditions.

Unit factors:

Type of vehicle, Category of road.

Human factors:

Category of road-user, Age, Sex, Influence of alcohol, Injury.

5. ROAD ACCIDENT STATISTICS IN THE EEC

Although it is not the intention of this report to give a detailed account of the road accident statistics currently compiled within the European Community, some evaluation of the current state of affairs could mean, for some of the factors listed in Section 4 that it would be possible to alter the targets for the level of breakdown of the categories. A survey of this type, without very many details, can then serve as a basis for assessing the timetable that must be drawn up for conducting any coordination projects that may be needed.

5.1 Technical data on vehicles

The technical condition of vehicles involved in road accidents is examined or assessed in most EEC countries. In most countries the results of these assessments form part of the police reports. But there has been no detailed examination of the degree to which it is the police who conduct these examinations or whether there is any regular coordination between the police and the specialists in vehicle technology who can, in practice, be partly organised by the police.

None of the existing systems explicitly divide up technical defects to identify a sub-group of defects which might have contributed to the accident. The categories thus lack any real distinction between technical defects in general, and technical defects which might have contributed to the accident in which the vehicle was involved.

The technical factors as a whole on the other hand are generally well represented in the following main groups: Braking system, steering gear, lights and light signalling devices, tyres, etc.

5.2 Medical data

In all nine countries police statistics contain information on the persons injured in accidents. In most cases this information is, however, restricted to classifying those involved in accidents as killed, seriously injured, slightly injured or uninjured.

Information which can show the connection between the causes and the effects of injury is only compiled as part of local ad hoc investigations. The results obtained do, however, show clearly enough that a considerable proportion of the information that could be usefully included in an international survey already exists in the health sector.

As for the causes of injury, it will normally be possible to at least differentiate between "traffic accidents" and other accidents. When police are called to an accident there will normally be no real difficulty in establishing which of the six or seven previously specified types of cause was most important for the accident in question.

As regards the types of injury, hospitals and doctors possess far more detailed information which is used as a basis for treatment than is necessary for inclusion in general international statistics. This raises the question of how to classify this detailed description of injuries, and it is important to stress that these are already recorded data which must be subject to additional processing to group them.

It can be difficult to assess definitively the effects of injury during an early stage of the treatment. But though this next remark is not based on a close acquaintance with procedure at European hospitals, it may be assumed that an estimate of the extent to which the hospital's resources will be burdened by a new case can be made quite soon after admission of that case.

The difficulty of giving a long or medium-term assessment of the reduction in a person's working capacity at an early stage of treatment is evident and it will therefore be necessary to allow hospital statistics a longer period of time to complete its data, than is needed for other road accident data.

5.3. Police data

As has already been pointed, police reports form the main source of the road accident statistics currently produced in the EEC, and are also the basis for most of the international surveys that are carried out. Furthermore, as discussed in Section 3, it is the flow of data from the police which forms a basis for coordination on a regional level as well as for the establishment of national road accident statistical systems. Both these factors are important in establishing international systems, see Section 3.2.3. figs. 8 and 9.

Because of the major importance of what the police do in this sector, it is worth examining the current possibilities within the three main groups of factors: accident, unit and human factors.

5.3.1. Accident factors

Table 1 provides a cross-reference between the accident factors and categories which are described as important in Section 4 and the currently available methods of obtaining this information.

The factors of time, nature of area, visibility and road condition are already described in such detail in national systems that consideration can even be paid to providing a further breakdown of the categories for visibility and road conditions, for example by stating whether poor road conditions are thought to have been caused by snow, ice, etc., and whether poor visibility is the fault of fog, rain or snow.

The most important accident factor, the accident situation, is also apparently quite well covered as all the countries satisfy the ECE requirements, at least approximately. But the congruence of definitions is only apparent. In reality the ten diagrams conceal crucial differences between the various countries' methods of classifying individual accidents.

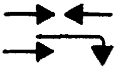
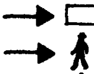
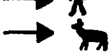
It is immensely important that the ideas used in categorising accidents in these situations should be completely clear. There are generally two ways of interpreting the application of accident situations and if the data, compiled according to different sets of rules, is compared then the interpretation of the material collected in this way will be very uncertain.

The basic idea of making a choice between alternative graphic descriptions of situations is that these distill out the essence of verbal descriptions of the traffic situation at the time of the accident which would otherwise be difficult to classify.

But unfortunately this is a common - and wrong - view that the descriptions of the situation leading up to the collision should contain information about the collision itself, which actually causes the injuries.

Annex I, Section 5.4.1. outlines the differences between the two methods of interpreting the term "accident situation", and cites an example of misuse when it describes an accident which should be classified as a type-4 accident (cf. fig. 10) but which has become a type-8 pedestrian accident because of misunderstandings.

TABLE 1. CROSS-REFERENCE BETWEEN ACCIDENT FACTORS, CATEGORIES AND NATIONAL ROAD ACCIDENT STATISTICS IN THE EEC

	B	D	DK	F	I	IRL	L	NL	UK
Time of accident	x	x	x	x	x	x	x	x	x
Year	x	x	x	x	x	x	x	x	x
Type of area	x	x	x	x	x	x	x	x	x
urban	x	x	x	x	x	x	x	x	x
other	x	x	x	x	x	x	x	x	x
Visibility	x	x	x	x	x	x	x	x	x
normal	x	x	x	x	x	x	x	x	x
poor	x	x	x	x	x	x	x	x	x
Road conditions	x	x	x	x	x	x	x	x	x
normal	x	x	x	x	x	x	x	x	x
poor	x	x	x	x	x	x	x	x	x
Accident situation	x	x	x	x	x	x	x	x	x
	x	x	x	x	x	x	x	x	x
	x	x	x	x	x	x	x	x	x
	x		x		x	x		x	
	x		x	x		x		x	
	x		x		x	x		x	
	x		x	x		x		x	
	x		x			x		x	
	x	x	x	x	x	x	x	x	x
	x	x	x	x	x	x	x	x	x
	x	x	x	x	x	x	x	x	x

The reason why there is a picture of the traffic situation just before the accident and not of the collision itself, is that it is impossible to avoid collisions merely by describing them. There is more chance of doing this by examining the traffic situation which led up to the collision.

This does not mean to say that the collision is unimportant. On the contrary, it is vastly important for accident prevention to have information about the effects of collisions on vehicles and on people. This information however constitutes what has been called unit and human factors. The accident situation is an accident factor!

5.3.2. Unit factors

The availability of data on the unit factors and categories listed in Section 4 is contained in Table 2.

The most important factor is the type of unit. The categories for this factor are almost complete as the only unclear issue is the criterion for differentiating between light and heavy goods vehicles; the proposal suggests 3000 kg gross weight.

Unexpectedly, there is justification for generally classifying the type of road as an accident factor as only two countries' statistics enable any relationship to be established between road-type and unit. As it has furthermore been shown that the categories are based to some extent on national administrative road classifications, the extent to which this factor should be included in an international survey must also be considered. It will therefore be desirable to be in a position to highlight motorway accidents for instance, and the recommendation should also be made that the factor is included which will mean for the countries which consider the type of road as an accident factor that each of the elements involved will be assigned the same value for the type of road factor when data is forwarded to the international system.

TABLE 2. THE AVAILABILITY OF DATA ON UNIT FACTORS AND CATEGORIES IN NATIONAL ROAD ACCIDENT STATISTICS IN THE EEC

	B	D	DK	F	I	IRL	L	NL	UK
Type of unit	x	x	x	x	x	x	x	x	x
Private motor cars	x	x	x	x	x	x	x	x	x
Light goods vehicles (3000 kg gross weight)	(x)	x	x	x	(x)	(x)	x	x	x
Heavy goods vehicles (3000 kg gross weight)	(x)	x	x	x	(x)	(x)			
Public service vehicles	x	x	x	x	x	x	x	x	x
Motor-cycles	x	x	x	x	x	x	x	x	x
Mopeds	x	x	x	x	x	x	x	x	x
Cycles	x	x	x	x	x	x	x	x	x
Pedestrians	x	x	x	x	x	x	x	x	x
Road type	(x)	(x)	x	x	(x)	(x)			(x)
Motorway			x	x					
Roads with more than two lanes			x	x					
Roads with two lanes			x						
Other types of road			x						

5.3.3. Human factors

The availability of data on human factors and categories in national surveys, equivalent to those in Tables 1 and 2, can be seen in Table 3.

TABLE 3. AVAILABILITY OF DATA ON HUMAN FACTORS AND THEIR CATEGORIES IN NATIONAL ROAD ACCIDENT STATISTICS IN THE EEC

	B	D	DK	F	I	IRL	L	NL	UK
Personal position	x	x	x	x	x	x	x	x	x
Driver	x	x	x	x	x	x	x	x	x
Front-seat passenger	x	x	x	x	x	x	x	x	x
Other passengers	x		x	x		x		x	x
Age	x	x	x	x	x	x	x	x	x
Year: 00,01,02...99	x	x	x	x	x	x		x	
Sex	x	x	x	x	x	x	x	x	x
Male	x	x	x	x	x	x	x	x	x
Female	x	x	x	x	x	x	x	x	x
Degree of intoxication	x	x	x		x	x	x	x	x
0/00: 0,1;0,2;...			x						
Injury	x	x	x	x	x	x	x	x	x
Death	x	x	x	x	x	x	x	x	x
Serious injury	x	x	x	x	x	x	x	x	x
Minor injury	x	x	x	x	x		x	x	x
Uninjured	x	x	x	x	x	x	x	x	x

All the factors selected are included in the national systems and the categories are also well-covered. The only point that differs from the general first-class opportunities of basing reports to the EEC on existing procedures is in assessing the degree of intoxication as a factor. The most commonly used categories are as follows: Alcohol test not conducted, alcohol test conducted and found positive, alcohol test conducted and found negative. These definitions of positives and negatives are based on the different national attitudes and laws described in Section 4.3.3. which limit the uses of information defined this way. Though none of the surveys drawn up by the individual countries contains an operational assessment of the influence of alcohol, this will have to be done if this factor, which certainly has an important influence in some countries, is to be covered by a joint EEC survey.

5.3.4. Connections between accident, unit and human factors

Sections 5.3.1. - 5.3.3. examine each factor individually about the data which could be available.

But there is one other important aspect which must not be overlooked when comparing the various national statistical systems, namely the link between the three types of factor, (see Section 2.1., which reveals connections between the human factors and the unit factors and between the unit factors and accident factors).

In most cases the connection between the man and the vehicle are more or less adequate but only in a few countries' surveys can these be correctly placed in the geometry of the accident situation.

To achieve this would of course be of great significance in the case of asymmetric accidents. In these types of accident the units appear in different positions in the traffic situation before the accident and it is important for this reason to relate them correctly to the accident situation. Annex I Section 5.4.3. discusses this problem further and devotes particular attention to the local application of accident statistics.

Establishing a link between the accident situation and unit factors, depends on attaching the right code number to each of vehicles in the accident situation (cf. Annex 3). These code numbers for the units would then serve as an accident identification factor along with the other unit factors. Annex I document 3 provides an example of accident situations with numbered elements.

The general survey of the situation referred to in Section 4.3.1., fig. 10 has no numbered elements but what has been said above shows that this type of numbering, used by the countries in their reports would considerably increase the value of a joint EEC survey.

6. PLAN OF ACTION

The factors discussed in Sections 4 and 5 relate to the traditional view of international surveys (outlined in 3.2.3. fig. 8) whereby the international system is seen as an umbrella covering the national systems.

The aim of an international system such as this is, as has been said, to collect more extensive data than is possible under any one national system. Since the system derived from this umbrella is limited by the least developed national system, the international material of this type will not always be sufficiently detailed to enable it to be used for research purposes, but it will generally be quite adequate as background material.

The use of the various factors in detailed surveys of traffic accidents would require their integration and often their extensive appraisal in a manner which could only be possible on a regional level. Such complete coordination is very costly, since it is necessary to have available a staff of specialists, each of whom is able to give an account of the traffic accidents taking place in his area. This method of procedure requires that the data acquired should be of very high quality which, other things being equal, means that analyses can be carried out with less detailed material than would be needed if the quality of the data were lower. But the involvement of experts will normally lead to a highly detailed determination of factors and values which, in itself, will increase the requirement for large amounts of data if complicated relationships are to be unravelled.

This aspect, together with the outlay required to operate highly coordinated regional systems, has been the main reason why such systems have been set up only to a very limited extent.

As part of international cooperation there should in the meantime be an arrangement covering exchanges of data between selected regions, as outlined in 3.2.3., fig. 9. The compilation of both qualitatively and quantitatively satisfactory research material could then be possible without the individual projects becoming prohibitively expensive.

6.1. General statistical surveys on traffic accidents in the European Community

As will have emerged from sections 4 and 5, the potential for drawing up one or more sets of traffic accident statistics on the basis of uniform material from the Member States is such that it would not be unrealistic to assume that at least part of such a Community system of accident statistics could be established within 3-5 years if the necessary funds were released by both the Community and the Member States.

The aim of this part of the plan of action is that once a year the Member States would pass on national information on road accidents to the Commission. Magnetic tapes would be used and the record layout would be as set out in Annex II. The format of the record is such that countries operating with adequate national coordination could include vehicle-technical and medical factors in the system. The remaining countries could supply this information in the tabular form shown in Annex II.

When the Commission had received the material from each country the common totals for each of the three statistical systems would be worked out and copies of these returned to the Member Countries in the form shown in Annex II.

6.1.1. Assignment of priorities

The burden which setting up such a system would place on the Member Countries' resources in this field could require the assignment of priorities to the problems to be solved if the system is to be made to work.

The police-based statistics are the most important, since they provide the most detailed information and cover the field most needing investigation in the background material. The most important problem is to ensure that the accident-situation concept is applied correctly and that the component parts are correctly situated within that situation (see Annex I, section 5.4).

6.2 Potential for the setting-up of highly coordinated regional systems of accident statistics within the Community

In contrast to the general systems, for which the basis for a common survey is laid down in the form of national systems in the Member Countries, the idea of highly coordinated regions is much less limited by decisions already taken.

This is both an advantage and a challenge. The advantage is that it is possible to carry out a thorough analysis of the problems which the system is to solve, and the objectives it is to fulfil, untrammeled by existing restrictions.

The challenge lies in coordinating the multifarious objectives and standpoints to be taken into account in such a way that a basis is forged for an operational system.

It is naturally not possible to foresee the final outcome of development work of this kind, which will probably extend over a period of 10–15 years. A prerequisite of the realization of some of the potential inherent in the setting-up of well coordinated regional systems is the carrying out of some project studies.

This could be done by forming a steering group to decide how far the ideas merit closer analysis. If the steering group, comprising representatives of the Member Countries and of the Commission, felt that the matter should be pursued further, a project group of experts and planners would be formed. The task of the project group would be to develop and set up the system and to report regularly to the steering group.

7. CONCLUSIONS

7.1. Short-term results

If the initial phase of the plans of action relating to general traffic accident statistics were put into effect it would be possible to institute international cooperation which would help the decision-making bodies in the participating countries to combat traffic accidents and their consequences. There are two particular requirements which must be met if the aims of accident prevention are to be pursued.

Finding the relationship between the various individual factors incorporated in the system would be helped, especially for the smaller countries and for cases where data acquisition is less dependable, and the availability of a larger volume of data would be a help.

It would be useful if the countries had at their disposal reasonably homogeneous material from an area extending beyond the national frontiers for use in forecasting the effect of sudden national action affecting road safety, such as the various reactions to the 1973 oil crisis. The improved basis for accident-prevention measures could in the short-term provide an additional back-up to the various national systems in use, which always have unexploited potential which the individual countries must be left to utilize.

The development of national systems could be inspired by corresponding projects carried out in other countries, and so it would also be useful here if there was a certain adaptation of the national systems to a common system, as would be the case if the initial phase of the plan were implemented.

This part of the action plan should be implemented as soon as agreement is finally reached on the form and content of the reports to be sent in. It is therefore more important that the timetable is adhered to, than that all nine countries are 100% involved at the start.

The drawing up of a timetable in good time is important in that the countries consequently have time in which to prepare the processes which depend on the common data. Immediate application would make possible a correspondingly quick appraisal of the system, so that any weak points could be eradicated at the start before the system became an established routine.

7.2. Longer-term results

In the longer term the national systems should move towards close coordination. Such a development would be very costly, so that there would be a limit to the amount by which data quality could be raised without at the same time restricting quantity.

The importance of such a restriction would however be reduced if it were possible to raise the problem above a national level, as the second phase of the plan of action proposes. This would cover the setting-up of representative, well coordinated regional statistical systems with correspondingly close international coordination.

In the longer term the creation of such regional systems might keep the acquiring of data on the causes and effects of accidents of sufficient quality and quantity for it to be possible to find out better than now which factors must be taken into account in the assessment of traffic accidents and what the connections between these factors are.

More knowledge like this is needed if traffic accidents and their damaging effects are to be reduced effectively - this being the final aim of all work on traffic accident statistics.

ANNEX I

PRINCIPAL FEATURES OF THE SYSTEM FOR THE REPORTING OF ROAD ACCIDENTS WHICH WILL COME INTO EFFECT IN DENMARK ON 1 JANUARY 1976.

1. OBJECTIVES OF THE FORM

It is an essential precondition of effective road accident control that the authorities dealing with the subject should posess information on road accidents in the past.

Systematic acquisition of data on accidents that have already occurred must form the basis for the necessary accumulation of information. A form is a useful tool of systematic data acquisition of this type, since it includes a number of previously determined factors, each of which can be assigned a separate fixed set of values.

Since the purpose of systematic data acquisition is to prepare uniform data which should, among other things, permit comparisons over prolonged periods, it is of course very important that the form to be used for data assembly should be drawn up in close cooperation with the data users, as an established form cannot be easily modified.

1.1. Users' wishes

The data users' interest in the layout of the form stems from the fact that the form acts as it were as a filter which sifts out the specific accident data to which the users require access from all the other information relating to a road accident. As the data users themselves will generally wish to select the factors considered relevant to a specific problem, there will normally be a great range of user requirements which must be met by the subject matter of the report forms.

1.2. Data suppliers

On the other hand, the procedure must be kept as simple as possible for those who have to complete the forms, i.e. the suppliers of the data. For one thing, the only information about circumstances that they can supply is that which they possess or can ascertain relatively easily.

So far as possible, a given piece of information should only be submitted once, irrespective of whether it is to serve several data users.

The completion of the individual form should also be simplified as far as possible, for instance by using printed answer boxes, by limiting the plain text, etc.

From the above it is clear that it is desirable from the point of view of the data supplier to simplify the report forms as much as possible.

1.3. Data processers' requirements

Forming a link between the data suppliers and users are the data processers who transfer the completed report forms to other storage media (e.g. magnetic tape) which, compared to the forms, are easier for the users to work with and which also form the basis of the statistics that are worked out by the data processers themselves.

The requirements of the data processers with respect to the report forms are influenced by the desire to make processing as simple and rapid as possible, an argument for the simplest type of form, but also by the desire to ensure that the data users' requirements are met to the fullest possible extent, which would indicate the need for a comprehensive form.

Thus, the situation of the data processers closely resembles that of the whole system, since there are arguments in favour of very complicated and also very simple forms, and it is therefore quite natural that the primary responsibility for working out forms normally rests with the data processers. In practice, modification of forms will always be the result of very close cooperation with data suppliers and users.

1.4. Data suppliers

Data on road accidents is assembled in the first instance by the police who themselves record the bulk of the information. Medical assistance is only required to obtain specific personal information which demands specialist medical knowledge. This includes the nature of any personal injuries and whether the persons involved were under the influence of alcohol.

1.5. Data processers

With regard to the scene of the accident, the local road authority, i.e. the technical section of the county or municipal administration, processes the information supplied by the police by converting it into a series of numerical codes, thereby facilitating subsequent recording on magnetic tape. This recording is carried out by Danmarks Statistik which is also responsible for checking that the deadlines for submitting accident reports are observed and that the forms are properly completed.

1.6. Data users

In addition to the data suppliers and processers already mentioned, all of which are also to some extent users, there are four principal areas of application for the information made available in some form or other by the data processers.

These are:

a. legislation
b. publicity bodies
c. highway administration
d. research

The first three of these provide the opportunity for affecting road safety by direct actions such as the passing of laws or regulations, carrying out publicity campaigns and introducing technical measures relating to roads. Decisions of this type are probably based in most cases on results from research or are incorporated into research projects.

1.7. Data flow

Figure 1 outlines the data flow between the data suppliers, processers and users involved. It is restricted to the actual reporting of the accident, and omits existing or desirable data flows from, for instance, the Government Vehicle Inspectorate or the hospital sector.

2. THE IMPORTANCE OF THE SET OF FORMS

In view of the above mentioned requirements of the parties involved, a working party under Danmarks Statistik has recommended the introduction of a set of forms to provide the basic data for the whole system.

Compared to the reporting systems used hitherto, the introduction of the recommended set of forms has a number of advantages.

2.1. Data suppliers

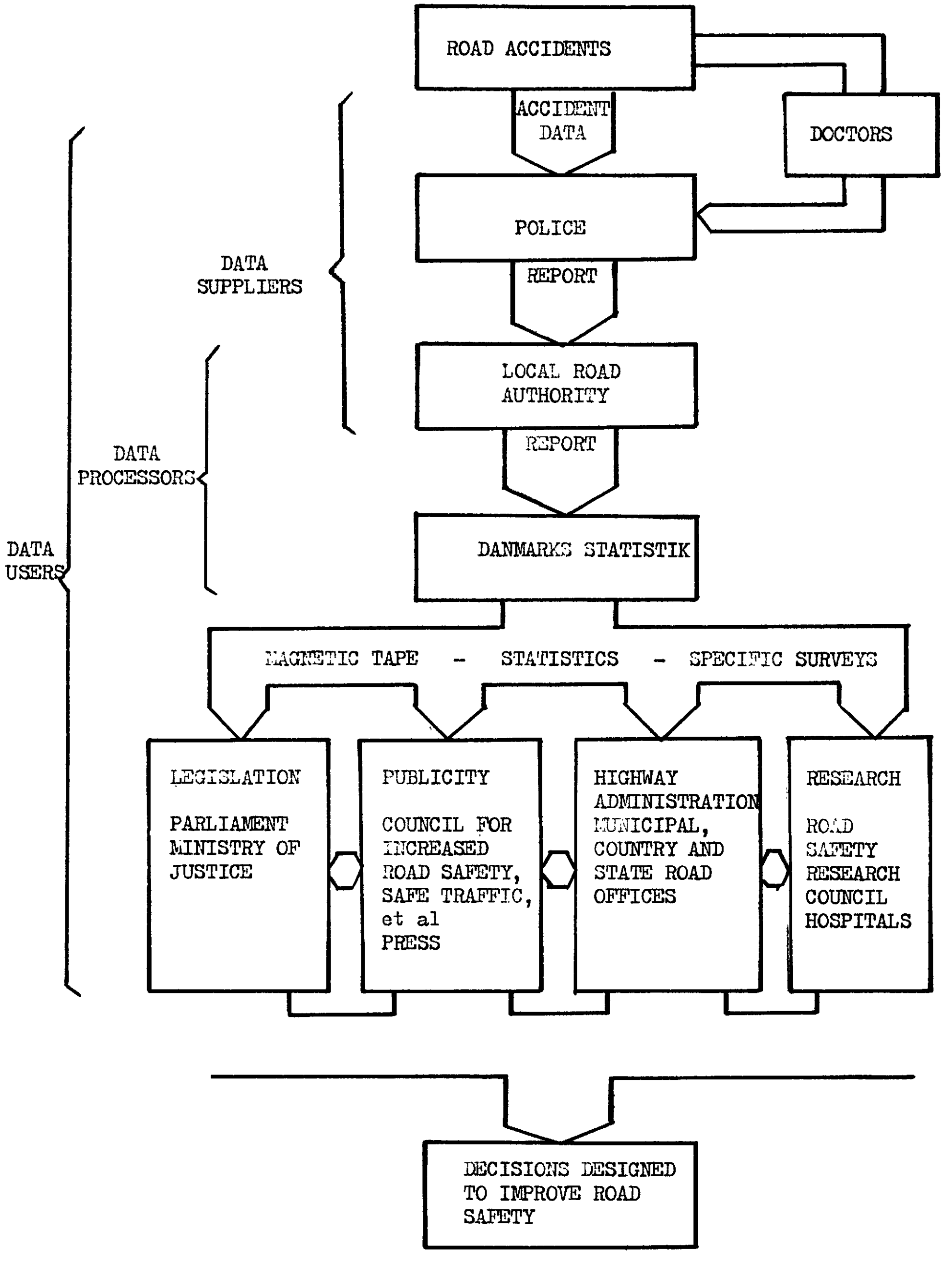
2.1.1. One-page form

In the first place, the form is easier to complete, the previous two-page format having now been replaced by one page. (Cf. Annex 1). This has only been made possible by changing the former printed answer boxes to code boxes. These codes are now supplied on a special code sheet, cf. Annex 2, which may be a considerable improvement since their inclusion on the actual form as at present can be inconvenient, as for instance whenever the form is completed by machine.

2.1.2. Several users of the same form

From the data suppliers' point of view, it is a further advantage that the set of forms is used by the road authorities and also by Danmarks

FIGURE 1. THE DATA FLOW FOR ROAD ACCIDENTS



Statistik so that there is no need to prepare special forms to be used by the road authorities for accidents covered by the system.

2.1.3. Relationship with the police report

From a data supplier's point of view the greatest drawback to the new set of forms is probably that it is not incorporated in the police report. The Ministry of Justice is, however, at present considering this incorporation as a possible way of reducing still further the work involved in completing the report form, but there is as yet no indication of the possible date for the implementation of such a measure.

2.2. Data users

2.2.1. Limited revision

As far as the data users are concerned, the new system in all essentials provides accident information comparable to that obtained under the report system applying hitherto. The change in the form has of course been accompanied by a revision of those fields requiring modifications and also a limitation of fields that have lost some of their previous importance.

2.2.2. Localization

The only radical change has been with regard to the users in the road offices (vejbestyrelserne), since it is now possible to pinpoint accidents in a really systematic manner. It is an important aspect of this system that the location should be coded locally by people who must be assumed to be more familiar with accident black spots than a central authority can be.

2.2.3. Collision report card (Påkørselskort)

In some areas of the country the police complete 'collision report cards' (Påkørselskort) for less serious accidents of a type on which no report is made. These collision report cards are not included in the new system, but it would seem advisable that areas which use the collision report card should consider employing a form corresponding completely or in part to the road accident form on which reports are to be made to Danmarks Statistik.

3. STRUCTURE OF A SET OF FORMS

The set of forms for reporting on road accidents comprises four forms which are printed on white, yellow, white and green self-carbonizing paper. The bottom three forms are A-4, whereas the top form is of smaller format.

3.1. Preliminary report

The object of the preliminary report is to provide the basis for Danmarks Statistik's rapid survey of road accidents involving personal injury. Accordingly, the form should be sent direct from the police to Danmarks Statistik within 24 hours of the occurrence of accidents involving personal injury. Where there are no personal injuries in connection with an accident, the form is not used at all and can be discarded. (Cf. Figure 2).

3.2. Road accidents, police

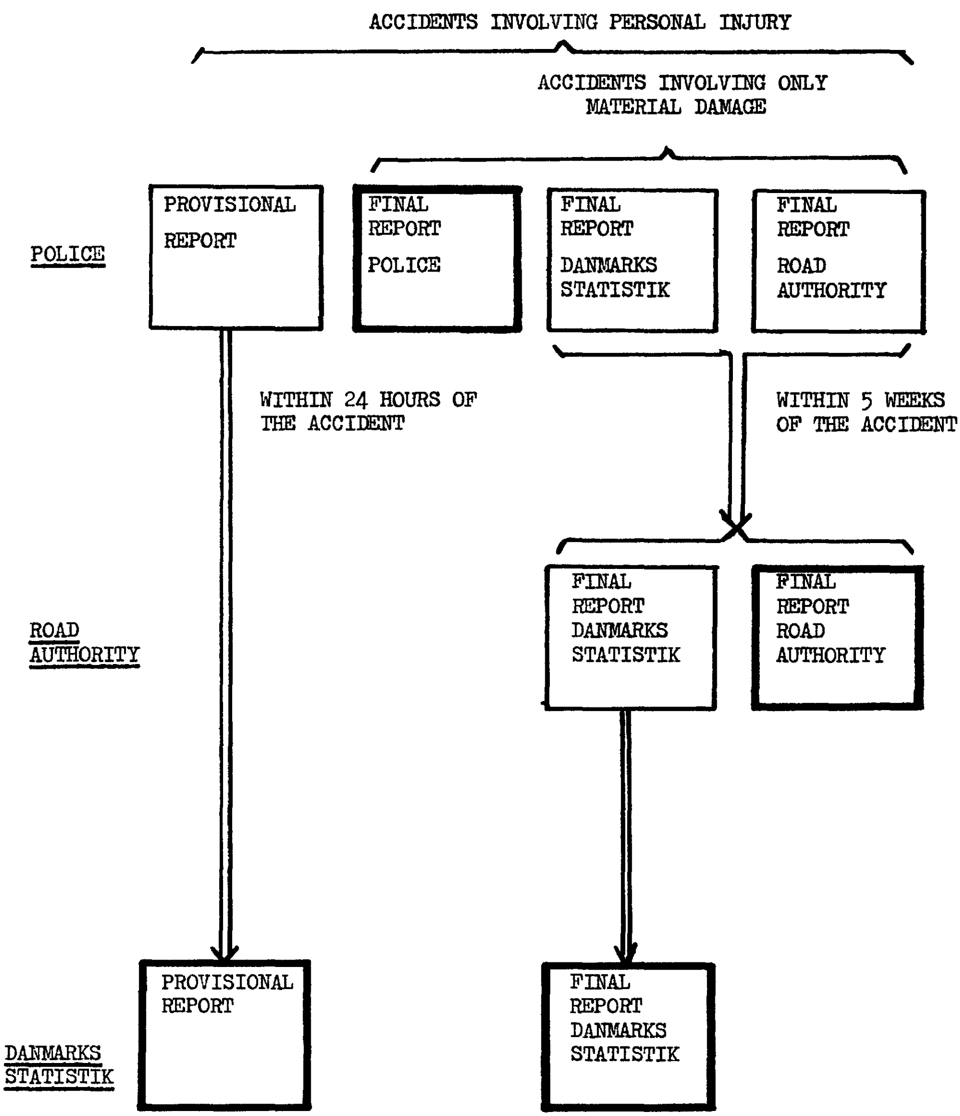
This form, which is to be retained by the police, is meant to be used as a supplement to the police report in court cases without thereby holding up reporting for statistical purposes as often happens under the present system.

It has furthermore proved useful for the police authority which completed the report to have a copy for use in dealing with telephone enquiries from Danmarks Statistik or the road authorities concerning any uncertain points.

3.3. Road accidents, final report

This form replaces the existing final report to Danmarks Statistik. It therefore represents the primary material for Danmarks Statistik's surveys.

FIGURE 2. TRANSMISSION OF FORMS FOR REPORTING ROAD ACCIDENTS



Whereas the form was previously sent direct to Danmarks Statistik, it should now be sent, together with the form 'Road accidents, road authority', to the technical section of the county administration.

3.4. Road accidents, road authority

This form provides the primary data for the various road offices. When the form, together with the 'Road accidents, final report', reaches the technical section of the county administration, a decision must be taken on who is to insert the locality code (county or municipality) and whether a copy of the report is to be sent to the other road offices. In the case of accidents on trunk roads, the highways department (Vejdirektoratet) should receive a copy.

4. USE OF THE SET OF FORMS

Road accident reports are bound up with the taking of police reports. (Cf. however the collision report card referred to above which, under local arrangements, may be used for less serious accidents).

The set of forms is, however, linked to the police report and the rules governing the taking of reports therefore also determine for which accidents the set of forms must be completed.

The Ministry of Justice is currently examining the detailed guidelines for the taking of reports by the police in connection with road accidents, but there is some evidence that the regulations currently in force in Copenhagen can mutatismutandis be applied throughout the country.

Under these regulations a report must be taken whenever the police learns of accidents of the following types.

4.1. Accidents involving a breach of traffic regulations

This is based on the police's first-hand judgement that there has been a sufficiently serious breach of traffic regulations to warrant bringing a charge against one or more road users.

4.2. Accidents involving personal injury

These correspond to the accidents which are at present reported to Danmarks Statistik. Every injury, however minor, to a person is at present described as a personal injury on which a report should be submitted. However, in practice it has become evident that there is apparently a tendency for the lower level of what the police consider constitutes personal injuries to be left rather vague.

Consequently, much consideration has been given to the fixing of a lower level for personal injuries which entail a report to Danmarks Statistik. These discussions have, inter alia, led to a proposal from a working party comprising representatives of data suppliers and also data processers and users to the effect that reporting should be restricted to such minor injuries as seem to indicate that the injured person will be totally or partially incapable of carrying out his ordinary work until the day following the accident at the latest; by 'ordinary work' is meant going to work, school, looking after a home, etc.

4.3. Accidents involving material damage in excess of Dkr 3 000

The lower limit of Dkr 3 000 per motor vehicle and approx. Dkr 100 for other material damage, on which the taking of a report depends, stems from the 'collision agreement' of 1 January 1962 between 36 motor vehicle insurance companies relating to the reciprocal waiving of the right of recourse in respect of damages totalling less than Dkr 3 000. This amount was increased to Dkr 5 000 in 1965 and even if the collision agreement is no longer formally in force, these rules are still observed in practice. This will probably mean that any clarification of the regulations for taking reports will include an increase in the limit for the taking of a report where the material damage involved amounts to Dkr 3 000 to Dkr 5 000 per motor vehicle.

4.4. Accidents involving foreigners or police officers and accidents involving fire in ore or more vehicles

Where foreigners are involved in accidents which result in a claim for damages against the foreign party a report should always be made.

The same applies if police employees are involved in accidents.

Finally, a report should always be made when, as a result of a road accident, fire has broken out in a motor vehicle or in a trailer drawn by a motor vehicle.

5. CONTENTS OF THE FORM

5.1. Identification and provisional information

Each set of forms has a preprinted serial number to facilitate identification. This number can therefore not be used when sending a reminder for final reports that have not been submitted, since no information is contained under that number and it is therefore necessary to state on the form the number of the police district and the time of the accident so that the accident can be identified, cf. Annex 1.

The total numbers of dead, injured and uninjured persons are only for use in Danmarks Statistik's provisional survey and it is therefore quite likely that there will be some variation between the totals at the top of the form and the information shown in the section 'Information on persons involved'; this is attributable to the different deadlines for the submission of the provisional and final reports. Where there is any discrepancy, the information contained in the section 'Information on persons involved' should in all cases be used.

5.2. Scene of accident

The section of the form relating to the scene of the accident represents the main innovation in the new form over the existing one. This is based on the need for more satisfactory and accurate information as to the location of the road accident within the road system.

The purpose of the boxes relating to the scene of the accident is that by this means and by using maps supplemented by road surveys the road authorities can complete the code which definitely pinpoints the scene of the accident, so that there is no need for actual investigations in the field.

The principle underlying the structure of the boxes is that the scene of the accident is designated by means of the name of a municipality or the name of a town within the municipality. This is followed by the actual road with its name and/or administrative road number, designation and also its status (trunk, county or municipal road). The exact location of the scene of an accident is determined by means of a "reference point" which may be a roadside marker, milestone or junction with a side-road. The scene of the accident must then be stated in terms of direction and distance from this point (degree of accuracy $\pm$ 10 m).

As the ultimate aim is of greater importance than the method used, in the case of accidents on municipal roads in built-up areas, the police and the road authorities may decide on the basis of a local mutual agreement to use the space for additional information about the scene for noting the accident in relation to house numbers.

The road-coding boxes are reserved for the relevant road authorities. For each accident, a county and municipality numerical code should be entered and for accidents on trunk roads and other main roads the actual location should also be stated, i.e. the road No. and position should be indicated (in the case of crossroads, the numbers of the two most important roads and also the position of the principal road). In the case of accidents on municipal roads, each municipality will be responsible for localizing the scene as far as is deemed relevant.

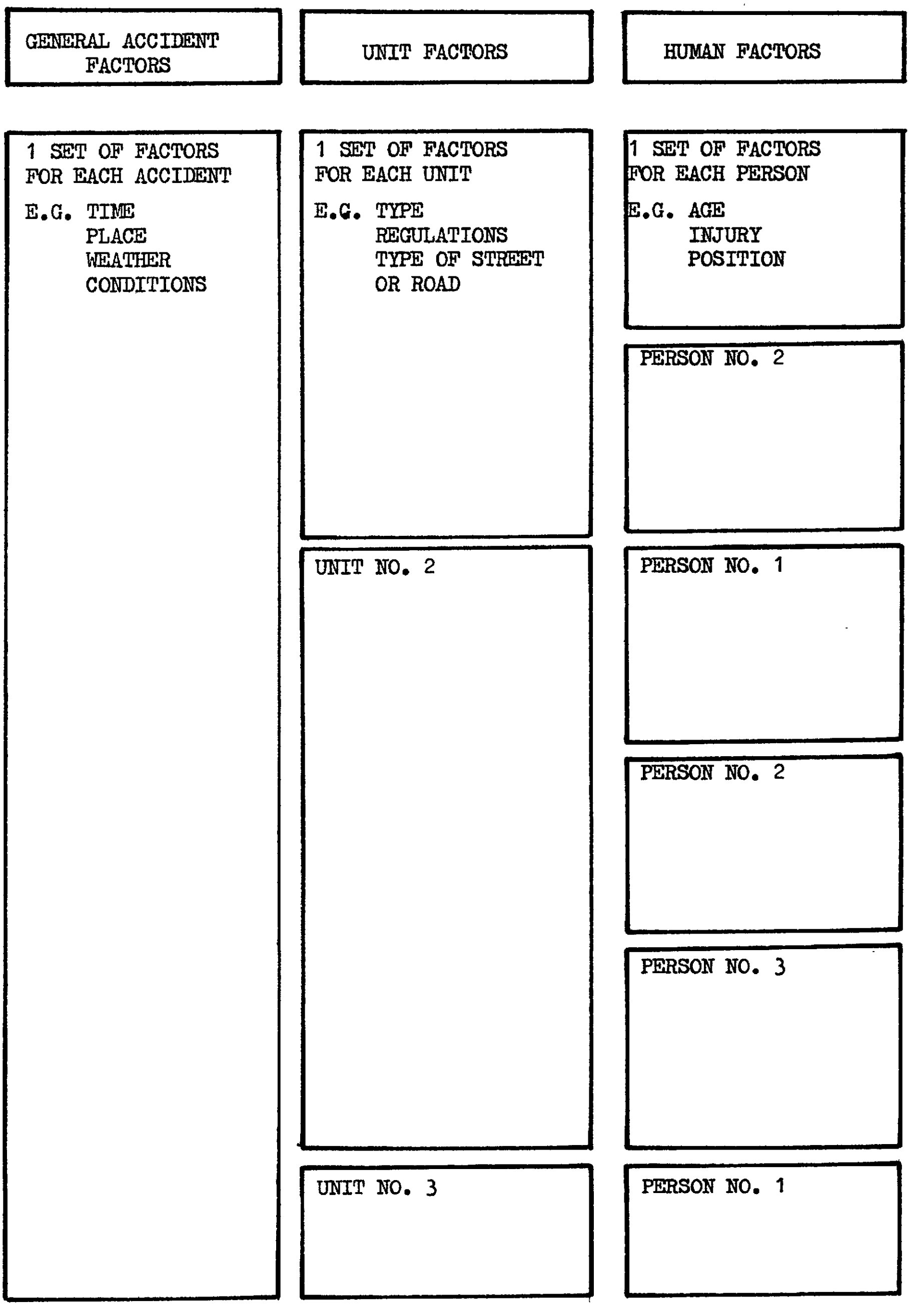
5.3. Concepts

In order to understand the structure of the form it is important to appreciate fully the factors described and their interrelationship. Figure 3 shows the relationships between general accident, unit and human factors.

By general accident factors are meant factors that apply to the accident as a whole, e.g. time, place, weather conditions.

Unit factors are linked to each separate unit involved and may include vehicles, pedestrians or any form of obstruction on or off the carriageway. Motor vehicles and pedestrians are described as traffic units. Unit factors include the type of unit, the regulations applicable to it and also the type of street or road.

FIGURE 3. GENERAL ACCIDENT, UNIT AND HUMAN FACTORS



The human factors refer to each of the persons involved and may include age, injury and position in the vehicle.

5.4. Accident situation

Information relating to the accident situation is fundamental and it is therefore vitally important that the data suppliers and users fully understand the rules for using the accident situation codes.

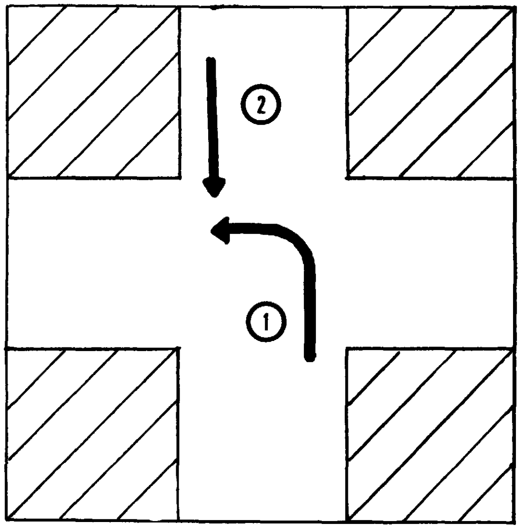
5.4.1. Contents of the description

The purpose of recording the accident situation is to give a realistic picture of the traffic situation which led to the accident. It is essential to emphasize that it is not necessarily the collision resulting in damage which is entered as the accident situation, since the actual collision may affect units other than those involved in the situation leading to the accident. An example of a distinction of this type between accident situation and collision is shown in Figure 4.

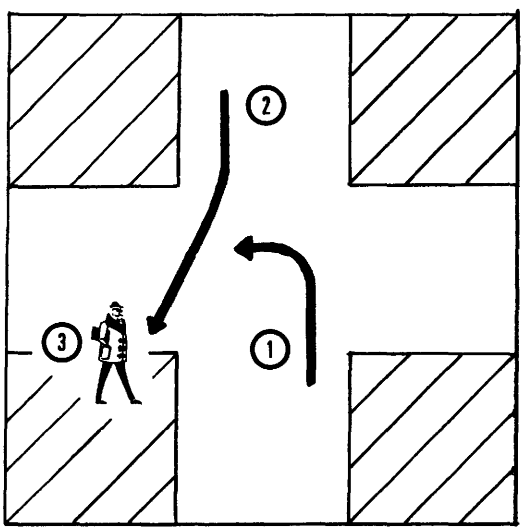
The illustration shows that a vehicle (traffic unit No 2) has collided with a pedestrian (traffic unit No 3) who is probably the only person injured in the accident. Nevertheless, the pedestrian does not feature at all in the accident situation, which shows, in contrast, that a vehicle (traffic unit No 1) was involved in the situation leading to the collision. Of course the collision may, and in most cases does, involve the units shown in the accident situation, but this does not alter the principle that the accident situation refers to the traffic picture immediately preceding a collision. The recording of the accident situation should not be used to determine whether the responsibility for the accidents rests wholly or partly with one or other of the persons involved, since its sole purpose is to classify in the most objective manner possible the introductory remarks typical of road accident reports, for example, in the case shown in figure 4.

FIGURE 4. ACCIDENT SITUATION AND COLLISION

ACCIDENT SITUATION 410



EXAMPLE OF COLLISION



"A was driving his car along North Street going south when, at the intersection with West Street, he observed a car which was about to turn left from North Street into West Street in a westerly direction. In order to avoid a collision A pulled over to the right ...."

The subsequent part of the description is not relevant to the coding of the accident situation, since the remark about A's evasive action is sufficient to establish that the left-turn situation was that which gave rise to the accident.

5.4.2. Principal groups of situations

A list of 64 specific accident situations, identified by 3-figure numbers, has been prepared, cf. Annex 3. The first figure indicates in which of the 10 principal accident groups the specific situation belongs, e.g. accident situation 410 belongs in the principal situation group 4 which covers situations arising between two vehicles travelling in opposite directions, of which at least one intended to turn left.

It is quite obvious that the 64 accident situations specified cannot possibly cover every single accident. Accordingly, if the accident can be placed in one of the 10 principal groups, even though none of the specific situations are applicable, the accident may be given the code number of this principal group followed by 99, e.g. 499.

Furthermore, very unusual accidents which cannot even be placed in one of the principal groups should be coded 999. This code then covers completely unclarified accident situations and also unclarified situations which fall within the principal situation group 9.

5.4.3. Determination of direction

If one compares the extract from the report quoted above with the appropriate accident situation, 410, it is implied that north must be "at the top" of the figure, since unit No 2 (person A), which was proceeding on a straight course, is stated to have been driving in a southerly direction. The direction as determined from the accident situation is not evident from the accident code only, as code 410 would also be used for an accident on the same spot in which the unit proceeding on a straight course was driving north whereas the unit that was turning came from the north, intending to turn east. Similarly, one can envisage two further possible situations which should be coded 410, viz. if the two units were driving along West Street which runs from east to west, cf. Figure 5.

Since it is important for decisions on measures relating to a specific locality to be based on the fullest possible information about accidents that have already occurred, it is necessary to determine the direction of the accident situation by stating the direction in which traffic unit No 1 was travelling. If a common system of numbering the units is laid down in this way for a given accident situation, for example, if the traffic unit that is turning in situation 410 is always unit No 1, then the accident situation can be presented with complete clarity.

Correct information on the direction of unit No 1 is essential not only to determine the direction of the accident situation but also in considering its bearing on the unit information.

Figure 6 shows a head-on collision in which the accident situation 240 shows that the direction data are immaterial, since, viewed from the point of impact, the accident seems symmetrical. However, the figure also shows that this is not always the case, since the type of the traffic units and the longitudinal section of the road may make it essential for the correct direction data to be supplied for the units, if the circumstances of accidents are to be properly assessed.

5.5. Description of locality

The remaining general accident factors are included in the section "Description of locality" which is to be completed using the special code list, cf. Annex 2. The choice between urban or rural area is based on whether the accident occurred inside or outside a 60 km.p.h. zone. The

FIGURE 5. ACCIDENT SITUATION 410

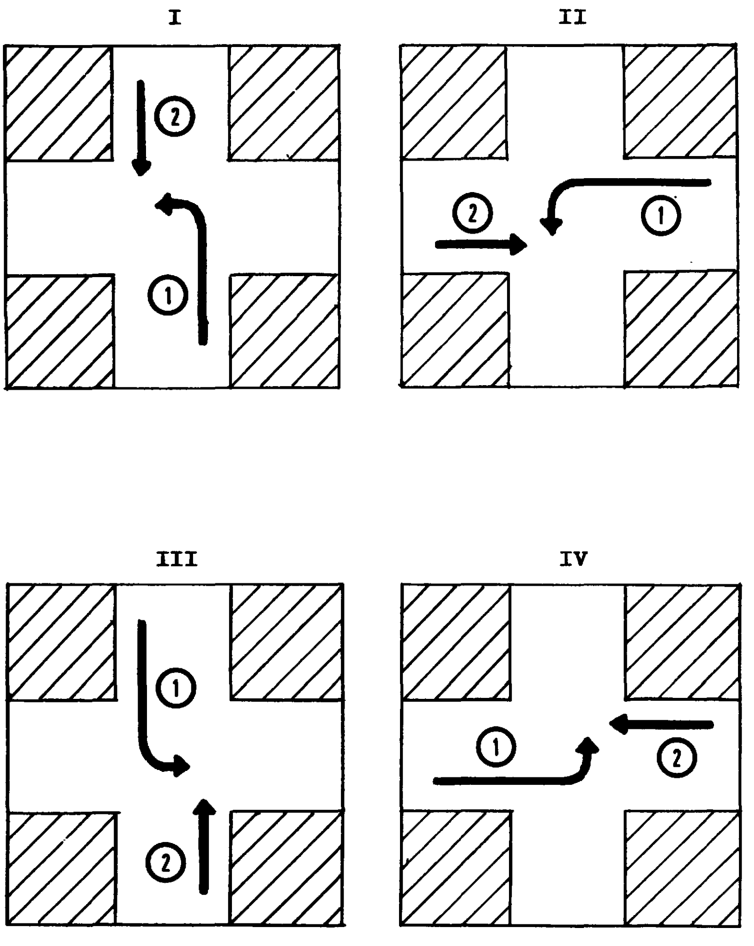
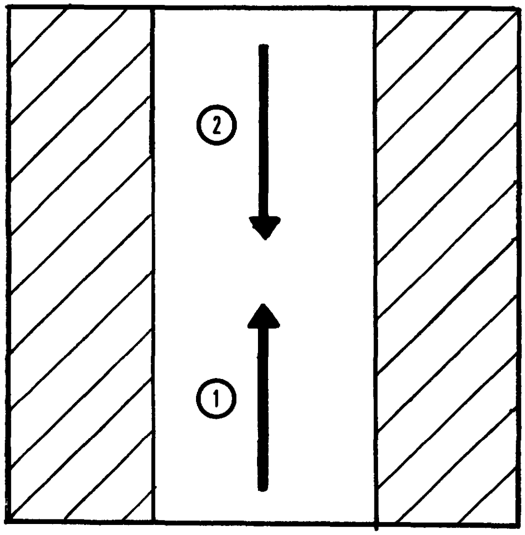


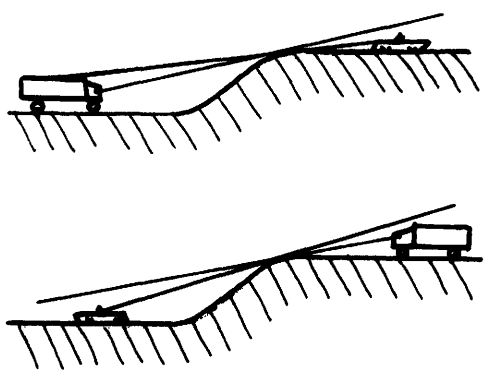
FIGURE 6. HEAD-ON COLLISION BETWEEN A MOTOR CAR AND A LORRY

ACCIDENT SITUATION 240



I.

II.



type of ribbon development should be determined by individual judgement from the range of possibilities shown. The use of codes 1 - 5 is conditional on the existence of direct access from the ribbon development to the road. Individual judgement should also be applied in entering the road, weather and light conditions, since it is impossible in each case to give easily applicable rules for differentiating between the various possible codes.

5.6. Accident description

As mentioned above, an accident involves one or more units and one or more persons. Information on these points will be found under 'Unit information' and 'Information on persons involved'.

5.6.1. Unit information

The number of the unit is the first item of information and, as previously stated, this number is the key to the positioning of the unit in the accident situation. Figure 6 has already shown that the correct numbering of units can be of decisive importance even in symmetrical accidents; if anything, this applies even more to accidents in which the traffic units perform different manoeuvres, for instance in the left-turn situation 410, if the accident involved different unit types, e.g. a moped and a car, it would be a determining factor whether it was the moped or the car that was turning left. If more units are involved than those shown in the accident situation they should be numbered consecutively. (Cf. figure 4).

5.6.2. Information on persons involved

As stated, several persons may be involved who belong to the same unit. For each traffic unit these persons should be numbered consecutively, and as the driver should always be entered first, all drivers will be numbered 1. Any passengers, can be numbered at random. The information on individual factors should be given in code form. (Cf. Annex 2).

5.6.3. Procedure for completing the two last-named sections

Figure 7 illustrates the procedure for entering the unit information and the information on persons involved under the section of the form entitled 'Accident description'. This shows that the details of each traffic unit should be fully recorded, i.e. that all the information on persons involved in the unit concerned are entered, before recording of the next unit begins.

FIGURE 7. PROCEDURE FOR COMPLETING THE 'DESCRIPTION OF ACCIDENT' FOR AN ACCIDENT OF THE TYPE SHOWN IN FIGURE 4

ACCIDENT DESCRIPTION				
UNIT INFORMATION			INFORMATION ON PERSONS INVOLVED	
No.	TYPE		No.	
1	11	XXX XX XX XX XX	1	XXXX XX X XX
			2	XXXX XX X XX X X
2	11	XXX XX XX XX XX	1	XXXX XX X XXX
			2	XXXX XX X XXX XX
3	71	XXX XX XX XX XX	1	XXXX XX X XX XXX

N.B. XXX XX, etc., indicates that the relevant space is completed.

BILAG 1

DANMARKS STATISTIK
Sejrøgade 11
Postboks 2550
2100 København Ø
Telf. (01) 29 82 22 - Telex 1 62 36

Færdselsuheld
Endelig indberetning

Tælling nr: 7200

Blanket-løbenummer: 1014788

L 2

Politikreds nr	Politikreds navn		Rapportskriver	Journal nr.

Personskade (Sæt ✓)	Antal implicerede personer	I alt	Dræbte	Alvorligt tilskadek.	Lettere tilskadek.	Uskadte
1 - Ja / 2 - Nej						

Ugedag (Sæt ✓)

Uheldstidspunkt

1 - Ma. 2 - Ti. 3 - On. 4 - To. 5 - Fr. 6 - Lø. 7 - Sø.

Dato (Dag, måned, år)	Klokkesl. (Tim og m.)

Uheldssted m. v.

Kommunenavn	Eventuelt bynavn inden for kommunen

Vej- eller gadenavn / Vejnr. og vejbetegnelse	Vejens eller gadens status
	Stats- eller amtsvej / Kommune- eller privatvej

Afst. fra grundpunkt	Retning fra grundpunkt mod uheldssted (Sæt ✓)	Grundpunkt (Kantpæl, km-sten, sidevej)
m	N NØ Ø SØ S SV V NV Ud for	

Eventuel supplerende stedsangivelse (Plads, husnummer el. lign.)

Vej-koder	Amts-kode	1–3	Kom.-kode	4–6	Vej-nr.	7–10	F-kode	11	Sted-kode	12–14 — 15–18	Ekstra kode (Vejnr.)	19–22

Uheldssituation nr.

Retningen, hvorfra færdselselement nr. 1 kom (Sæt ✓)

1 - N 2 - NØ 3 - Ø 4 - SØ 5 - S 6 - SV 7 - V 8 - NV

L 1½

Kortfattet beskrivelse af uheldet

Stedsbeskrivelse m. v.

1 By- eller landområde	2 Randbebyggelse ..	3 Vejkryds m. v.	4 Føre	5 Vejrforhold ...	6 Lysforhold ...	7 Vejbelysning ...

Uheldsbeskrivelse

Elementoplysninger								Personoplysninger													
		Politinummer															Personnummer (CPR-nr.)				
																				Løbe nr.	
Element nr.	Elementets art	Bogstav	Nummer	Gade- eller vejtype	Cykelsti eller fodgængerovergang	Regulering	Hastighedsskøn	Person nr.	Personens art	Personskade	Skadens type	Skadens årsag	Hospital m. v.	Spirituspåvirket	Sygdom m. v.	Sele eller styrthjelm	Dato	Måned	År	3 cifre	1 ciffer (køn)
10	11	12	13	14	15	16	17	20	21	22	23	24	25	26	27	28	30	31	32	33	34

DSt 7200-01/3 1000-03.75 Bording-Paragon 40097

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Sejrøgade 11
Postfach 2550
2100 København Ø
Tel. (01) 29 82 22 - Telex 1 62 36

ANNEX 2

ROAD ACCIDENTS

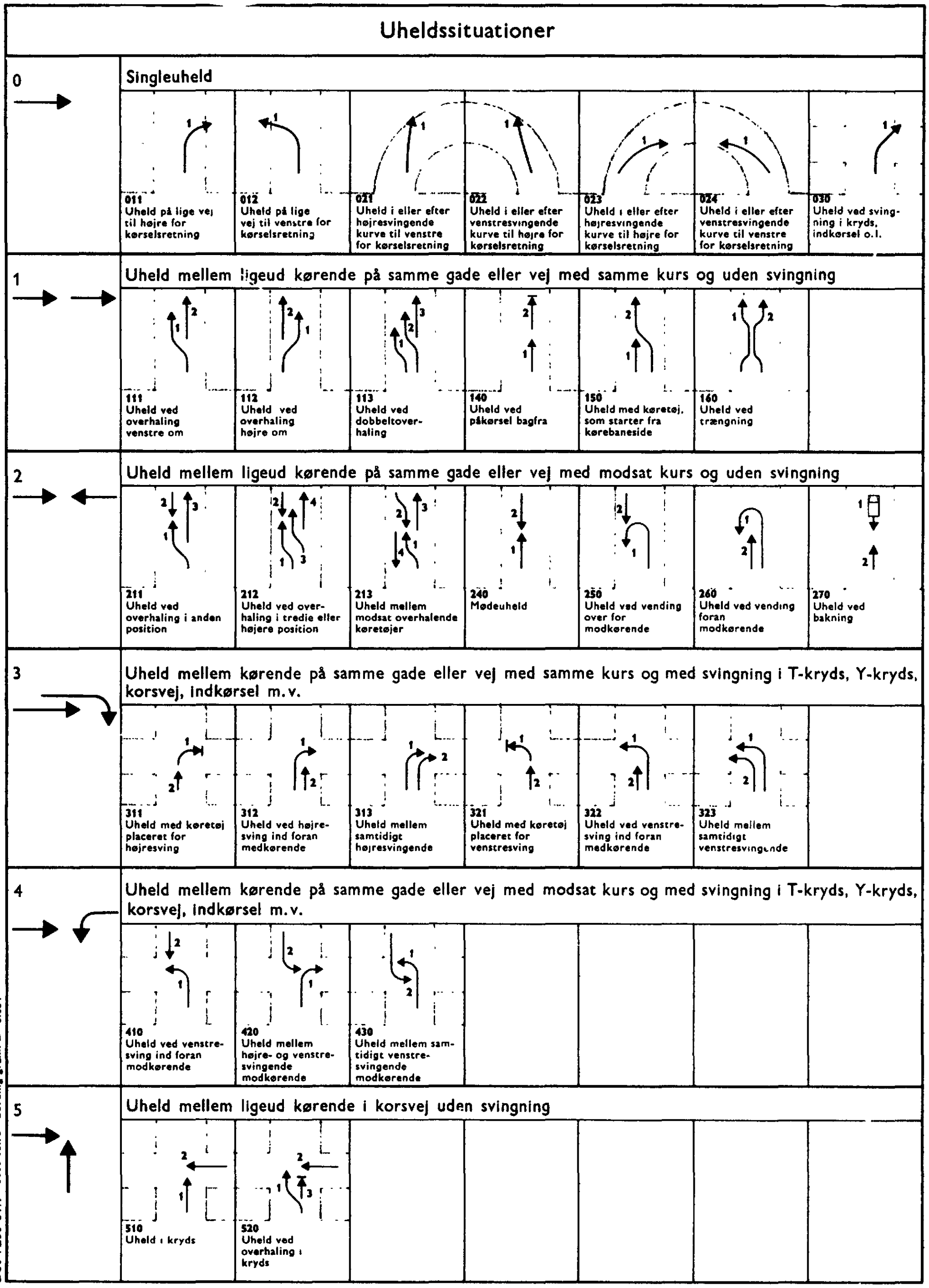
	Description of locality and accident
Locality	Description of locality 1. Urban or rural area 1 Urban development 2 Rural district 2. Ribbon development (with direct access to the street or road) 1 Shopping thoroughfare 2 Industrial area 3 Residential area, high-rise development 4 Residential area of detached housing and other low-rise development 5 Other ribbon development fronting the road 6 Unbuilt-up area or ribbon development not fronting the road 3. Junctions, etc. 1 Crossroads 2 T-junction 3 Other junctions 4 Exit or entrance 5 Level crossing: manned, full gates or half gates 6 Level crossing: unmanned, sound or light signal 7 Level crossing: unmanned, other 8 Other road configuration, bend 9 Other road configuration, straight road 4. Road condition 1 Dry 2 Wet, not slippery 3 Wet, slippery 4 Ice, snow, sleet, etc. 5. Weather conditions 1 Clear 2 Good visibility, but with some precipitation 3 Poor visibility: rain 4 Poor visibility: other precipitation 5 Poor visibility: fog 6 Poor visibility: other causes 6. Light conditions 1 Daylight 2 Dusk 3 Dark 7. Road lighting 1 Good 2 Poor 3 Non-existent

Accident	Description of accident	
	Unit information	12.-13. Vehicle registration number
	11. Type of unit Traffic unit 11 Ordinary motor car 12 Taxi 13 Hired car 14 Ambulance 21 Van, total weight 0-2000 kg 22 Van, total weight 2001-3000 kg 31 Single lorry exceeding 3000 kg total weight 32 Lorry exceeding 3000 kg total weight, including trailer 33 Articulated vehicle 34 Bus 35 Tractor, motorized equipment, etc., with or without trailer 36 Train 37 Person on horseback, horse-drawn vehicle or other non-motorized vehicle 41 Motorcycle with or without sidecar, bubble car 51 Moped 61 Bicycle 71 Pedestrian 99 Unidentified Obstructions on the roadway 81 Animals 82 Stones, beets or other loose objects 83 Barriers, etc. 84 Other objects on or in the roadway Obstructions off the roadway 91 Roadside trees 92 Crash barriers in the central reservation 93 Other crash barriers 94 Lamp standard, traffic bollard, fence, etc. 95 Other objects off the roadway	To be entered only in the case of vehicles with Danish number plates. However, for foreign-registered vehicles, the country's identification letter should be recorded in column 13. Where units involved have disappeared after the accident with the result that detailed information is not available on all relevant circumstances, the code number 99 should be entered in column 12. 14. Type of street or road 1 Motorway 2 Access to or exit from motorway 3 Other road section with central reservation 4 Other one-way traffic 5 Two-way traffic: other road of 4 or more lanes, with centre line or lane markings 6 Two-way traffic: 3 marked lanes 7 Two-way traffic: other road section with centre line 8 Two-way traffic: other road section without centre line 9 From or to building, field, filling station, car park, etc. 15. Bicycle track or pedestrian crossing (To be completed only in the case of accidents involving mopeds, bicycles or pedestrians) 1 Bicycle/moped on bicycle track 2 Bicycle/moped at entrace to or exit from bicycle track 3 Bicycle/moped not using available bicycle track 4 Bicycle/moped, no bicycle track available 5 Pedestrian on pedestrian crossing 6 Other pedestrian

Accident (continued)	16. Traffic lights and road signals, etc. 1 Halt sign 2 Give way sign 3 Traffic light: green for traffic concerned 4 Traffic light: amber for traffic concerned 5 Traffic light: red for traffic concerned 6 Flashing amber light at junction or pedestrian crossing 7 Other permanent road signs 8 Temporary road signs 9 No road signs 17. Estimated speed 1 Stopping 2 Low speed after moving off 3 Below 40 km per h 4 40–60 km per h 5 60 – 80 km per h 6 Over 80 km per h - Leave blank where not known Information on persons involved 21. Category of person 1 Driver with driving licence for less than 1 year 2 Driver with driving licence for between 1 and 3 years 3 Driver with driving licence for between 3 and 5 years 4 Driver with driving licence for 5 or more years 5 Driver without driving licence where licence is required 6 Driver otherwise without driving licence 7 Front seat passenger 8 Other passenger 9 Pedestrian 22. Personal injuries 1 Killed 2 Seriously injured 3 Minor injuries - Leave blank if uninjured	23. Nature of injury 1 Concussion, fractured skull, facial lesion, lesion of the eye 2 Thoracic and/or abdominal lesion 3 Lesion of the vertebral column and/or pelvis 4 Fracture/dislocation or severe spraining of the shoulder, arm or hand 5 Fracture/dislocation or severe spraining of the hip, leg or foot 6 Serious injury to several parts of the body 7 Burns 8 Superficial injury only - Leave blank if uninjured 24. Cause of injury 1 Flung against wheel, front panel or windscreen 2 Injured by lateral impact 3 Injured by impact from the rear 4 Injured by car overturning 5 Thrown out of car 6 Crash while driving a two-wheeled vehicle 7 Run into by a two-wheeled vehicle when driving or as a pedestrian 8 Other or unknown cause - Leave blank if uninjured 25. Hospital, etc. 1 Hospitalized 2 Treated at a casualty centre 3 Not brought to a casualty centre - Leave blank if uninjured 26. Influence of alcohol The alcohol level per thousand parts should be entered here correct to 1 decimal place. For instance, 0.8‰ should be entered as 08. - Leave blank in the case of a negative alcohol reading. 27. State of health, etc. 1 Under the influence of medicine or drugs 2 Incapable of driving in traffic for other reasons (excluding the influence of alcohol)

Accident (continued)	- Leave blank where no observations are indicated. 28. Seat belt or crash helmet (and child's safety seat, if applicable) (Only to be completed for cars, motorcycles or mopeds) 1 Seat belt in use 2 Crash helmet in use 3 Child's safety seat in use 4 No use made of seat belt, crash helmet or child's safety seat 5 Details unknown 30.-34. Personal number (CPR No.) If this is not known, the year of birth of the person involved (the two last figures) should be entered in column 32 and his/her sex (1: male, 2: female) in column 34, if possible.

Færdselsuheld



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6 Uheld mellem kørende på hver sin gade eller vej med svingning. (T-kryds, Y-kryds, korsvej, ind- og/eller udkørsel m.v.)

- **610** Uheld ved højre-sving ud foran »medkørende«
- **620** Uheld ved højre-sving ud foran »modkørende«
- **630** Uheld ved højre-sving ud foran »modkørende« i overhalingsposition
- **640** Uheld ved højre- el. venstresving foran højre- el. venstre-svingende modpart
- **650** Uheld ved venstre-sving ud foran »medkørende«
- **660** Uheld ved venstre-sving ud foran »modkørende«
- **670** Uheld ved bakning om hjørne

7 Uheld med parkeret køretøj m.v.

- **710** Uheld med køretøj parkeret i højre gade- eller vejside
- **720** Uheld med køretøj parkeret i venstre gade- eller vejside
- **730** Uheld med køretøj parkeret i venstre gade- eller vejside ved overhaling
- **741** Uheld ved åbning af vogndør mod kørebanen af holdende eller parkeret køretøj
- **742** Uheld ved åbning af vogndør mod cykelsti af holdende el. parkeret køretøj

8 Uheld med fodgængere

- **811** Uheld med fodgængere fra højre fortov eller -bat
- **812** Uheld med fodgængere fra venstre fortov eller rabat
- **831** Uheld med fodgængere trådt frem bagved holdende køretøj
- **832** Uheld med fodgængere trådt frem foran el. ud mellem holdende køretøjer
- **835** Uheld med fodgængere stående på kørebanen
- **836** Uheld med legende børn på kørebanen
- **841** Uheld med fodgængere gående i vejens højre side
- **851** Uheld med fodgængere gående i vejens venstre side
- **860** Uheld med fodgængere på fortov eller lignende
- **871** Uheld med fodgængere fra højre før køretøjs passage af kryds
- **872** Uheld med fodgængere fra venstre før køretøjs passage af kryds
- **873** Uheld med fodgængere fra venstre efter køretøjs passage af kryds
- **874** Uheld med fodgængere fra højre efter køretøjs passage af kryds
- **875** Uheld med fodgængere fra venstre efter højresving
- **876** Uheld med fodgængere fra højre efter højresving
- **877** Uheld med fodgængere fra venstre efter venstresving
- **878** Uheld med fodgængere fra højre efter venstresving
- **880** Uheld med fodgængere ved bakning

9 Uheld med dyr eller faste genstande m.v. på kørebanen

- **910** Uheld med dyr på kørebanen
- **920** Uheld med faste genstande m.v på kørebanen
- **930** Uheld med afspærringsmateriel på kørebanen

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ANNEX 3

R o a d   a c c i d e n t s

Accident situations				
0	Single accidents			
	011 Accident on a straight road to the right of the direction of travel	012 Accident on a straight road to the left of the direction of travel	021 Accident to the left of the direction of travel on or after a right-hand bend	022 Accident to the right of the direction of travel on or after a left-hand bend
	023 Accident to the right of the direction of travel on or after a right-hand bend	024 Accident to the left of the direction of travel on or after a left-hand bend	030 Accident while turning at a junction, entrance, etc.	
1	Collisions between vehicles travelling straight ahead in the same direction in the same street or road, where no turn is executed			
	111 Collision occurring during overtaking on the left	112 Collision occurring during overtaking on the right	113 Collision during double overtaking	140 Rear-end collision
	150 Collision with vehicle moving off from the kerb	160 Collision caused by vehicles converging		
2	Collision between vehicles proceeding along the same street or road in opposite directions without turning off			
	211 Collision while overtaking in the second position	212 Collision while overtaking in the third or higher position	213 Collision between vehicles overtaking in opposite directions	240 Head-on collision
	250 Collision caused by U-turn in front of a vehicle approaching from the opposite direction	260 Collision caused by U-turn in front of following vehicle	270 Collision caused by reversing	

3	Collisions between vehicles proceeding along the same street or road in the same direction and turning at T-junctions, Y-junctions, cross-roads, entrances, etc.			
	311 Collision with a vehicle positioned for a right turn	312 Collision caused by cutting across a following vehicle to turn right	313 Collision between vehicles turning right simultaneously	321 Collision with a vehicle positioned for a left turn
	322 Collision caused by cutting across a following vehicle to turn left	323 Collision between vehicles turning left simultaneously		
4	Collision between vehicles proceeding along the same street or road in opposite directions involving a turn at T-junctions, Y-junctions, cross-roads, entrances, etc.			
	410 Collision caused by turning left across an oncoming vehicle	420 Collision between vehicles turning into the same street	430 Collision between vehicles turning left simultaneously	
5	Collision between vehicles proceeding straight ahead at a cross-road			
	510 Collision at a cross-road	520 Collision caused by overtaking at a crossroad		
6	Collisions between vehicles proceeding along different roads in which a turning maneouvre is involved (T-junction, Y-junction, cross-roads, entrance and/or exit, etc.)			
	610 Collision caused by turning right into the path of a vehicle proceeding in the "same" direction	620 Collision caused by turning right into the path of a vehicle coming from the "opposite"direction	630 Collision caused by turning right into the path of an overtaking vehicle coming from the "opposite" direction	640 Collision caused by turning right or left into the path of an oncoming vehicle performing the same maneouvre
	650 Collision byturning left into the path of a vehicle proceeding in the "same"direction	660 Collision caused by turning left into the path of a vehicle proceeding in the "opposite"direction	670 Collision caused by reversing round a corner	

7	Collisions with stationary vehicles, etc.			
	710 Collision with a vehicle parked on the right-hand side of the street or road	720 Collision with a vehicle parked on the left-hand side of the street or road	730 Collision when overtaking with a vehicle parked on the left-hand side of a street or road	741 Collision caused by the door of a stationary or parked vehicle being opened on to the road
	742 Collision caused by the door of a stationary or parked vehicle being opened on to a bicycle track			
8	Collision with pedestrians			
	811 Collision with pedestrians leaving the right-hand pavement or reservation	812 Collision with pedestrians leaving the left-hand pavement or reservation	831 Collision with pedestrians stepping out from behind a stationary vehicle	832 Collision with pedestrians stepping out from in front of or from between stationary vehicles
	835 Collision with pedestrians standing on the roadway	836 Collision with children playing on the roadway	841 Collision with pedestrians walking along the right-hand side of the road	851 Collision with pedestrians walking along the left-hand side of the road
	860 Collision with pedestrians on the pavement etc.	871 Collision with pedestrians crossing the vehicle's path from the right at a junction	872 Collision with pedestrians crossing the vehicle's path from the left at a junction	873 Collision after a junction with pedestrians crossing the vehicle's path from the left
	874 Collision after a junction with pedestrians crossing the vehicle's path from the right	875 Collision following a right turn with pedestrians from the left	876 Collision following a right turn with pedestrians from the right	877 Collision following a left turn with pedestrians from the left
	878 Collision following a left turn with pedestrians from the right	880 Collision with pedestrians while reversing		

9	Collisions with animals or other fixed objects, etc. in the roadway			
	910 Accidents involving animals on the roadway	920 Accidents with fixed objects etc. on the roadway	930 Accidents with barriers on the roadway	

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ANNEX 4

ROAD ACCIDENTS

Instructions	
Use, etc.	USE OF THE SET OF FORMS FOR ROAD ACCIDENTS Use of the set of forms by the police The set of forms is to be completed by the reporting police authority for all accidents coming to their attention that fulfill the following conditions: 1. The accident took place in a public street, road, square, area, etc. 2. At least one traffic unit involved in the accident was on the scene for traffic purposes. 3. At least one traffic unit involved was moving. 4. The accident resulted in: 1. Personal injuries By this is meant that at least one injured person is deemed to be incapable of carrying out his/her normal functions on the day after the accident, at the latest. 2. Other damage of such a kind that a police report of the accident was taken. The set of forms should be used in the following manner: 1.Where accident resulted in personal injury: 1. The first short sheet of the set of forms, i.e. "Road accidents - Provisional report" should be sent to Danmarks Statistik not later than 24 hours after the time of the accident. 2. When a set of forms is completed, the sheet "Road accidents - Police" should be torn off and kept as a police copy.

	3. The sheets "Road accidents - Final report" and "Road accidents - Road authorities" should be sent together to the local road authority, i.e. the technical section of the county administration, not later than five weeks after the time of the accident. 2. Where the accident did not result in personal injury: 1. The first short sheet of the set of forms "Road accidents - Provisional report" should be torn off and discarded. 2. The remaining sheets of the set of forms should be used in the same manner as when personal injury is involved. Accordingly the top part of the sheets should also be completed. The road authority's use of the section of the set of forms forwarded to them. 1. The relevant codes should be entered in the area marked "Road codes". By local agreement this coding can be undertaken by the relevant municipalities in respect of municipal roads. 2. The sheet "Road accidents - Final report" should be torn off and sent to Danmarks Statistik not later than three weeks from the date on which it is received, i.e. not later than eight weeks after the time of the accident. If there is a local arrangement regarding coding by the municipality then the municipality concerned is responsible for submitting the forms on time. 3. The sheet "Road accidents - Road authority" is the copy for the road authority (municipality).

Scene of accident	SCENE OF ACCIDENT, etc. Scene of accident The name of the local authority and possibly a more exact locality (the name of village within the local authority, for instance) should be stated in addition to the name of the road or street or the administrative number and description of the road. The status of the road or street should also be shown by inserting an X. The scene of the accident should also be stated in terms of the distance (in metres) from a specified datum point (roadside marker, milestone or junction with side road). The direction of the scene of the accident from this datum point should be indicated by an X. Where the accident occurs by the actual datum point (roadside marker, milestone, or side road) the direction from the reference point should be entered as "At the reference point" and the distance shown as 0 metres. "Additional information on the location of the scene" should be entered separately. This provides for local agreements between the police and the road authority on the use of such information as house numbers to determine the location. Accident situation The situation <u>immediately preceding</u> the accident and the taking of any evasive action should be included in the accident situation data. In accordance with the chart "Road accidents - Accident situations", a 3-figure number should be entered for the accident situation. Where it is only possible to classify the accident situation within one of the ten principal groups (0-9), the number of the group should be entered as the first figure, followed by 99, e.g. 199, 399 and 799. The number 999 is used to cover entreis under the principal group 9

	and in part whenever the accident is so unusual that it is not possible to classify it in one of the principal groups at all. Where one of the accident situations on the chart can be used, the direction of the accident is determined by inserting an X to show the direction from which traffic unit No. 1 which was involved in the accident was coming. Brief description of the accident It is vitally important that the numbering of the units under this section should correspond exactly with that used in the chart "Road accidents - Accident situations". For instance, in situation 510 the traffic unit which is approaching from the right of the other traffic unit should always be designated unit No. 2.
Locality	DESCRIPTION OF LOCALITY, etc. The circumstances under which the accident occurred should be entered in the spaces 1-7 using the codes shown in the chart "Road accidents - Description of locality and accident" under the section "Description of locality".
Accident	DESCRIPTION OF ACCIDENT Unit information 10. Unit No. The unit corresponding to unit No. 1 on the chart "Road accidents - Accident situations" should be entered as unit No. 1 on the first line. The unit No. and the relevant information on persons involved should only be entered once for each unit. This means that where there are several persons in the same vehicle, the lines under the section "Unit information" will be left blank opposite person No. 2, 3, etc. Accordingly, unit No. 2 should be entered immediately after the last person connected with unit No.1 and so on.

11.-17. Sundry unit information

The information should be entered by referring to the codes shown in the sheet "Road accidents - Description of locality and accident" under the main section "Description of accident" and the subsection "Unit information".

The information should be entered for all units involved, i.e. including any parked vehicles.

Information on persons involved

Wherever possible, information on the drivers of vehicles and also any pedestrians involved should be included. Where applicable, information on injured passengers should also be entered. Injured persons in parked vehicles should always be treated as passengers and the relevant information entered accordingly.

20. Person No.

The persons in <u>each</u> traffic unit involved in the accident should be numbered from 1 up.

The drivers of vehicles involved should in each case be entered as person No. 1, i.e. a driver can only appear as person No. 1.

Each pedestrian involved constitutes a separate traffic unit. The person involved should therefore be entered as person No. 1, i.e. pedestrians can only appear as person No. 1.

All persons involved should be numbered. Uninjured persons in parked vehicles are therefore <u>not</u> viewed as being involved and are therefore not numbered.

Where it is impossible to obtain the appropriate information for columns 21-34, for instance because a vehicle has driven away from the scene of the accident, only person No. 1 should be entered in column 20, thereby showing that the vehicle concerned had a driver.

	21.-34. Sundry information on persons involved The information should be entered by referring to the codes shown in the chart "Road accidents - Description of locality and accident" under the main section "Description of accident" and the subsection "Information on persons involved". Where it is not possible to obtain information on persons involved (see the instructions for column 20) the relevant lines should be left blank.

ANNEX II

TRANSMISSION FORMS FOR TRAFFIC-ACCIDENT DATA FROM MEMBER COUNTRIES OF THE EEC

1. Record layout for police statistics and any associated vehicle-technical or medical information

Subject	No of characters	Code
Recording period	2	Calendar year
Country identification	2	01 - 09
Accident situation	1	0 - 9 (see fig. 10)
Availability	2	
Type of area	1	1 urban 2 non-urban
Visibility	1	1 normal 2 poor
State of roads	1	1 normal 2 poor
Code identifying role of the vehicle in accident	1	1-9 (serial number)
Type of vehicle	1	1 private motor car 2 light goods vehicle (3000 kg gross wt.) 3 heavy goods vehicle (3000 kg gross wt.) 4 public service vehicle 5 motorcycle 6 moped 7 cycle 8 pedestrian 9 other

Subject	No of characters	Code
Type of road	1	1 Motorway 2 More than 2 lanes 3 Two lanes
Vehicle-technical survey	1	1 carried out 2 not carried out
Braking system	1	1 fault 2 no fault
Braking system, fault	1	1 serious 2 not serious
Steering gear	1	1 fault 2 no fault
Steering gear, fault	1	1 serious 2 not serious
Lights and light signalling devices	1	1 fault 2 no fault
Lights and light signalling devices, fault	1	1 serious 2 not serious
Tyres	1	1 fault 2 no fault
Tyres, fault	1	1 serious 2 not serious
Passive safety equipment	1	1 fault 2 no fault
Passive safety equipment, fault	1	1 serious 2 not serious
Other	1	1 fault 2 no fault
Other, fault	1	1 serious 2 not serious
Individual code number	1	1-9 (serial number)
Function	1	1 driver 2 passenger, front seat 3 passenger, other
Age	2	00-99
Sex	1	1 male 2 female

Subject	No of characters	Code
Effects of alcohol	2	blank = not known - not examined 00-99 (0.0-9.9%)
Injury	1	1 fatal 2 serious 3 slight 4 nil
Cause of injury	1	1 being thrown against steering wheel or windscreen 2 side-on collision 3 rear-end collision 4 vehicle overturning 5 thrown out of the vehicle 6 being knocked down by a two-wheeled vehicle 7 being run over while on a two-wheeled vehicle or on foot 8 other cause
Type of injury	1	1 cerebral concussion, fracture of the cranium, lesions of the face 2 lesions of the thorax and/or abdomen 3 lesions of the spinal column and/or pelvis 4 fracture/dislocation or severe strain in the shoulder, arm or hand 5 fracture/dislocation or severe strain in the hip, leg or foot

Subject	No of characters	Code
		6 serious injury to several limbs
		7 burns
		8 slight injuries to tissues only
Period of treatment	3	000–999 days in hospital
Time off work	3	000–999 weeks incapacity

2. Table summarising the results of vehicle-technical surveys not coordinated with police statistics

	type of vehicle[1]					
	1	2	3	4	5	6
Number of vehicles examined	—— vehicles ——					
Braking system; fault, serious fault						
Steering gear; fault, serious fault						
Lighting and light-signalling devices; fault, serious fault						
Tyres; fault, serious fault						
Passive safety equipment; fault, serious fault						
Miscellaneous; fault, serious fault						

1) same code as in record layout

3. Table summarising medical records not coordinated with police statistics

	Cause of injury [1]							
	1	2	3	4	5	6	7	8
Period of treatment (days)	—— persons ——							
Time off work (weeks)								
Total casualties								
Type of injury [1] 1								
2								
3								
4								
5								
6								
7								
8								

[1] Codes as used in record layout

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Discussion by the PANEL
Intervention by Mrs. HILL

I speak here today, not so much as an expert on traffic accidents statistics myself, but as a representative of one major group of users of these statistics.

The International Road Federation, which I represent here today, itself collects each year a set of international accident statistics, which are supplied to it by its Member Organisations, and which form part of its general document, which is called World Road Statistics.

The accident figures are selected to meet the needs of road users for international information, as far as possible on a comparable basis, and they consist solely of figures on the total number of accidents, injuries and of deaths with respect to the level of traffic and the proportions of injury accidents, which take place at night and in urban areas. You will think this is very simple.

In an ideal world, road users would seek comparable statistics which would allow them to draw parallels between national accident rates and between their development over time, in order to find the reasons for these differences and therefore to be in a position to take a view distinguishing between safety measures, which have a genuine impact, and those where safety advantages may be outweighed by other problems to users. In this respect, there are road users who are particularly interested in certain relationships : in the relationship, for example, of accident rates to the standard of the road in order to determine correct priorities for road construction programmes, in the relationship to the condition of the road to determine criteria for road maintenance, and in the relationship to the relevant legislation, for example on speed limits and on alcohol. Present statistics do not meet these needs at all adequately. In fact there are still considerable gaps and anomalies even in the very basic information, which is collected in World Road Statistics. I will mention briefly some of these problems : there are differences in the definition of death, in the definition of levels of injury, of road standards and conditions, and of vehicle class. This last point is particularly relevant with respect to heavy goods vehicles, because of national differences in the classification of these vehicles. In some areas in which users would be greatly interested, we have no reliable figures at all on an international basis. There are for example no strictly comparable figures on the background conditions leading to accidents th which Mr ANDREASEN referred nor on the effects on legislation.

Taking these points into account and referring specifically to the proposals made in Mr ANDREASEN's report, the improvment in international statistics which would be of most value to all users would be some progress towards perhaps a very simple set of data which would be available early, from all countries and on a strictly comparable basis. This, we consider, would be of more value than to aim for a much more ambitious coverage of data with the result, either that statistics are not available until much later because of processing problems, or that there still remain large gaps in international availability.

Intervention by Miss SABEY

In my presentation I have interpreted the brief differently, more specifically in the context of the main symposium on motor vehicle design. So I want to examine the methodology of collection of accident statistics for the purposes of research into aspects of motor vehicle design with of course the main emphasis on car design. But the principles I want to put forward apply equally to considerations of the road environment on the road user.

First and foremost, it is imperative to decide what the objectives of this collection of data are and what use is to be made of the data, before attempting in any way to detail systems of data collection. I see the objectives as fourfold.

1. To assess the magnitude of the problem and to monitor trends. In this area much is already known in every country about the types of collision -whether frontal or side impacts, whether vehicle/pedestrian or vehicle/vehicle collisions, etc...

2. The second objective is, I believe, to assess the effects of regulations or recommendations. For example the effect of the use of vehicle headlights or the effect of the use of high intensity rear lights in fog.

3. The third objective : to examine both accident and injury causation, to give a better understanding of the basic problems.

4. And the fourth objective : to assess risks related to vehicle components, or in the broader sense to road environment or road user characteristics. In terms of vehicle components, this may mean such things as the use of seat belts or particular features of design.

The collection of data must match the needs of these objectives. I suggest that there are three levels of investigation, which have varying application at international level.

1. Basic statistics enable trends in the pattern of accidents to be checked and ensure that priorities are kept in perspective. They also have use in assessing regulations and providing a background against which more detailed investigations may be compared. It is important in this context to recognize that basic statistics must include background data as well as accident data, as Mrs Hill has already said : that is, the background data needed may be data on road, traffic, vehicle usage, speeds etc..., this in order to provide a measure of risk.

2. At the other end of the scale, depth investigations, expertise of several disciplines, are needed to increase the basic understanding of accident and injury causation. The present state of knowledge is such that it is clear that injury causation takes precedence over accident causation where vehicle factors are concerned. They are not, of course, in other areas. Again, much is already known about injury patterns and mechanisms by which injuries occur : but the outstanding problem (which has been mentioned several times in the main symposium) lies in determining human tolerance to injury.

3. The third level of investigation needed is an intermediate one in which greater numbers of accidents may be investigated than in the depth investigations, but of course at the expense of some detail. This, in the short term, would give assessments of risk related to vehicle features, and, in the long term, measures of the benefits of changes in vehicle design.

Two important criteria are paramount for deciding on the data elements in any system of collection. Firstly the reliability of reporting must be sound : if any item of data is reported inconsistantly or inaccurately it is useless. This is especially true when collating data on either a national or an international level. Secondly, if data from different zones are to be aggregated (whether within one country or between different countries) the sampling system must be well defined and allowances for natural bias must be made - for example, bias due to different police methods which affect the reporting operation, and different hospital services, which affect the reporting of injury. The consequences of unsatisfactory sampling may lead to different conclusions in the analysis.

Now, what action is needed within the Community in terms of co-ordination of accident statistics ? Already internationally, a number of organisations have discussed such co-ordination :

- In 1969, the OECD held a symposium which outlined some of the needs and made some recommendations relative to both basic statistics and more detailed investigations.
- As already mentioned, the ECE produces co-ordinated basic statistics annually and have for some years had continuing discussions on definitions.
- In relation to vehicle safety specifically, Working Group 1 of the EEVC has already explored data systems available in Europe, and discussions of data collection are continuing.
- As far as depth investigations are concerned, NATO/CCMS pilot study of crash injury undertaken some years ago has led to the setting up of an OECD ad hoc group to co-ordinate activities in countries where active teams exist. These are Belgium, France, Germany, Netherlands, United Kingdom, Canada, Sweden and the United States.

In terms of the needs of the Community, I submit that for basic statistics little more is needed than a refinement of the ECE definitions for adoption as a data collection system, to provide basic comparisons only. The experience of ECE and my own experience in the United Kingdom of co-ordinating data from different countries has shown extreme difficulties in extending a data bank beyond anything very basic because of unreliability of the reporting at source. Mr. Andreasen has indicated this in his paper : there I disagree in detail with many of his suggestions for data elements, because of the likely unreliable reporting on the scale of the Community. But how do we meet the very real need - probably the major need in terms of vehicle safety - to determine levels of human tolerance to injury ? This can only be done by depth investigations on a local level. In the United Kingdom we have plans at the Transport and Road Research Laboratory to develop our in-depth investigations to include crash reconstruction and vehicle dynamics related to injury. At the same time we are developing a co-ordinated project to build up a large enough sample of accidents nationally to enable us to assess risks and probability of injury related to vehicle features : to do this we shall need to make the best use of our resources by co-ordinating the work of all four active teams in the United Kingdom, that is the Transport and Road Research Laboratory, Vehicle Engineering and Inspection Directorate of Department of Environment, Birmingham University where Dr Mackay leads the team, and London University.

Other countries I know are undertaking and planning work on similar lines. But to establish an identical methodology for all teams in all countries is to my mind impraticable, and I suspect years would be wasted agreeing on the data elements and system. The urgent need, which could be achieved quickly, is not an international data collection system other than a basic one, but an international documentation system which would give ready access to analysis and to results of depth investigation, whether these are related to vehicle safety, to road environment or to human factors. By this means, findings of research can be more readily disseminated and discussed, leading the way to greater collaboration between member countries in implementing results in terms of regulations and determining needs for future research projects.

Intervention of the PROFESSOR GRAFFAR

Going back to what has been said by the preceding speakers on the subject of the necessity for simple basic data enabling not merely national but also international comparisons to be made, I should like to say a few words from a strictly medical point of view. The statistics based on the number of persons injured in accidents, on the number of seriously injured and of slightly injured, appear at first sight to be simple. However, it certainly seems that on the one hand the definitions of seriously injured and slightly injured are not satisfactory from the medical point of view, while on the other hand they do not enable completely valid international comparisons to be made. To begin with the least complicated problem - the definition of death due to the accident - it must be pointed out that in Belgium, until 1971, only those killed outright were considered as fatalities. Since 1971 the definition has been somewhat changed, and persons who die before arriving at the hospital are defined as fatalities resulting from the accident. In a working party of the symposium convened at Vienna last month by the World Health Organization and devoted to the epidemiology of road accidents, a British colleague demonstrated with reference to a follow-up study, that those who die at the actual time of an accident or in the next few hours represent, all things considered, only a small fraction of the total number of persons who will die from the accident. The further the observation is prolonged the more this fraction increases. After one week, it is still less than half, and after 30 days it reaches 93 % of the total number of persons who will die.

It therefore seems that in order to obtain a reasonably correct idea of the numbers injuries caused by an accident it is necessary to count these fatalities after an adequate observation period, and according to this British study 30 days would appear to be a suitable period. Obviously, it will be more difficult to count the dead after 30 days than count those killed outright, which can be easily done by the police. However, hospital statistics are generally sufficiently well kept for it not to be too difficult to come to an agreement on a definition of this type and to employ it systematically. With regard to morbidity, things are more complex. In Belgium, accident victims who have stayed at least 24 hours in a hospital are considered as seriously injured. From the medical point of view, this definition is certainly not satisfactory for distinguishing between seriously injured and slightly injured persons. Anybody who, after an accident, has visible injuries or simply complains of obscure pain or disorders should systematically be taken to hospital for observation; according to the case, this will enable a decision on the absence of serious injuries to be reached after several hours or several days of observation and tests.

Certainly, therefore, this definition of a seriously injured person is not satisfactory, but what other definition is to be chosen ? A definition based on the length of hospitalization ? A definition based on the duration of the lasting incapacity ? As has been stressed by the previous speakers, it would be necessary to try not to complicate the collection of data unnecessarily, and the duration of hospitalization - although I admit that it is an arbitrary criterion - would probably be the most simple to adopt. A duration of hospitalization exceeding a week would probably demonstrate clearly enough the distinction between seriously injured and slightly injured, since it is probable that few slightly injured people would remain in hospital longer than 7 days. Such a definition would certainly remove all the slightly injured persons from the category of seriously injured.

I should like to confine my contribution to these few words, Mr Chairman, and submit them for consideration by the participants.

Intervention by Mr HARTMANN

Policies aimed at reducing the frequency and gravity of road accidents would be much more effective at no additional cost if better use were made of statistics. If today's seminar leads to decisions being taken in this direction, we shall be happy to have taken part in it.

Mr Andreasen has pointed out in his report that, if statistics are to be put to good use, the various bodies who vie with each other in drawing them up must keep to those areas of observation in which they have special knowledge, and, instead of competing, try to complement one another in the contribution they make to regional, national and international surveys. Perhaps he will allow me to compare his analysis to that of the European Committee on Experimental Vehicles, which appeared in June 1974 in the report presented by its first working party, and say that the motor vehicle manufacturers expect a great deal from the implementation of the proposed programmes. To say that the manufacturers are expecting this programme to be carried out is an understatement : in some countries they are assigning some of their own engineers and statisticians to the analysis of accidents. These analyses are being conducted in close cooperation with the police and the hospital services with the following main objectives in view : to classify collisions in terms of frequency and severity according to the specific safety measures which they call for; to measure the impact force and specify the maximum force at which the protection system is to remain effective in any given accident configuration in order that a substantial number of occupant casualties shall benefit from it; to measure the tolerance level of the human body to impact by relating the reactions of various body segments to the measurable values of the impact force parameters, which specialists are able to estimate from real-life accidents; finally, to check the efficiency of all the various protection systems with which cars are equipped, whether or not they are required by law. In this connection we would point out that, in the matter of determining the causes of injuries sustained in accidents -a very tricky business- Mr Andreasen may perhaps be overestimating the analytical facilities available to the authorities responsible for filling up the forms annexed to his report. The analyses made by the manufacturers benefit greatly from international contacts which have been built up in recent years between their specialists, who are trying in particular to harmonize the methods of classifying impacts. These contacts, however, are not enough.

Some of the observations that are made on accidents must be backed by references to much larger samples before they can be taken as representative: only then will they enable us to generalize and take decisions such as whether or not to introduce or perfect a given system of protection. The characteristics and the size of these samples will depend on the nature of the information from which the generalization is to be made. It is known, for instance, that impact tolerances vary with age : this fact must therefore be taken into account in defining the physical characteristics of the protection systems, just as one has to attone for the scattering of occupant weights and heights around the mean values. It is at the national level, and with the help of international exchanges, that this information must be collected and disseminated.

For the purpose of assigning impacts to specific categories and grouping them in terms of frequency and severity according to the various degrees of force involved, reference must be made to a representative national sample analysed in just sufficient detail to enable one to determine the statistical weight of the cases studied in depth. At the risk of appearing chauvinistic, I feel I ought to mention as an example of a reference sample the one which the French national road safety organization has undertaken to describe in detail by a 1/15 analysis of the accidents that occur on the national road network. This analysis is sufficiently detailed to enable any in-depth analysis of smaller samples that may be undertaken elsewhere to draw upon it for the information required for the generalization of the observed phenomena. Reverting to the analyses carried out by the manufacturers, I would say they would have much wider relevance if the national statistics and those exchanged between countries gave a more precise classification of certain occupant groups.

It seems to us essential to know whether or not the occupants were using the compulsory safety equipment at the time of the accident because, as long as the action of this equipment is not automatic, there will always be a substantial number of people who do not comply with the obligation to use them. If, to take an optimistic view, we assume that one day there will be no more than 1,000 occupant fatalities left to be saved in Europe, it will still be worth knowing how many of these were wearing belts and how many were not in order to improve occupant protection standards still further.

The ratio between the weights of the vehicles involved in accidents has an important bearing on the state of the occupants involved on either side. To my way of thinking, this would seem to indicate that the countries should agree to adopt vehicle weight categories, and to show the frequency and severity of the collisions that occur in each category.

Furthermore, it is not enough to place the casualities in occupant categories : one also needs to know how they link up with the categories of the opposing vehicles or machines, which means that cross-reference tables will have to be drawn up. The identification of the machines, vehicles or obstacles struck is important, for it is just as necessary to reduce the aggressiveness of vehicles as it is to improve the protection they afford in the event of collision. Likewise, one needs to know for each category the relative frequency and severity of impacts with obstacles lining the roads. Given a certain speed at the time of striking the obstacle, the force of the impact will depend on the characteristics of the obstacle struck. In order to find optimum solutions to the problem of compatibility,we require an adequate knowledge of those characteristics and an accurate estimate of the probability of this type of impact.

Finally, although harmonized definitions of fatalities and severe or minor injuries are highly desirable, it seems to me no less desirable to harmonize the criteria for including accidents in the statistical count. As long as official statistics refer only to bodily injuries, the steady improvement in the standard of primary and secondary safety afforded by the vehicles will be reflected, if at all, only in abstract and approximate figures giving, for instance, the number of casualties per million passenger kilometers, which the public at once interprets as meaning : "Still as many road deaths as ever, and more and more cars on the road".

The participation of the insurance companies in preparing national statistics - aided perhaps by the bodies representing vehicle repairers - would enable a count to be made of the material accidents not involving bodily injury, and thus enable us to follow the trend in vehicle safety and pinpoint the areas where work still has to be done.

In making these few suggestions, we are doing little more than echo the wishes that have often been voiced by manufacturers over the past few years. It is important that each country should adopt the system of accident description that is most appropriate to solve the problems that arise in that country. There are good systems and there are some less good. In international discussions it is essential for each representative to have the assurance that the others have reliable statistics and are using the same terminology. If this is the case, the talks are greatly facilitated : every country can then make use of the experience of the others, especially in the areas referred to by Miss Sabey at the beginning of her address, and the work of coordination safety policies can go ahead more rapidly. Should one nevertheless try to introduce common forms for the production of systematic international statistical tables ? I do not feel that this is called for. The various bodies concerned, who are represented here, are anxious to obtain from international statistics certain information which they do not contain.

If one had to satisfy everybody - and statisticians in particular - international publications would swell to alarming proportions. The important point is not to satisfy all the people who are hungry for statistical information, but to have perfectly adequate statistics with the requisite features to that they will serve as a guide to safety projects and help in monitoring their effects. This they will be able to do all the better if clear and realistic policies on safety have been agreed between the countries.

Intervention by Mr. de REGT

I have listened with great interest to the introduction given by Mr Andreasen, and I have also read his report. It gives an impression of the manner in which the authorities in Denmark endeavour to compile road safety statistics, and I must say that I find the project an extremely ambitious one. Let us hope for the best from it. The report in itself is a good starting point for our discussion here : it presents a good picture of what is at present possible thanks to the increased and accelerated use of automation.

With your permission, I should like to introduce myself in greater detail. I represent an organization of road users known as de Koninklijke Nederlandse Toeristenbond ANWB, which, was founded in 1883 and, with a membership of 1.7 million, is now the largest organization of its kind in the Netherlands. The Secretariat of our organization has a department manned by traffic experts which carries out a wide and varied range of activities for our members. These activities include issuing memoranda to technicians (i.e. road constructors) and to public authorities, as well as organizing congresses and meetings of experts. The ANWB also publishes a technical journal which is the only one of its kind in the Netherlands. In other words, as an organization of road users we try, by "having a say" in technical discussions, to influence both the technicians of the policy-making bodies and the politicians. In that connection, I should first of all like to comment on the scheme of international cooperation as presented to us by Mr Andreasen here this morning and as also mentioned in his report.

Private organizations, as represented by Mrs Hill of the International Road Federation, not only have links with the national policy-making bodies but also have the necessary means of exerting influence both at international and at local level. At local - or, if you like, at national - level, a clearly discernible influence as regards vehicle construction and maintenance is brought to bear via the inspection stations operated by our organization in the Netherlands and by our sister organizations in other countries.

Direct influence can also be exerted in other sectors. In the Netherlands, for instance, the signposting of roads throughout the country is done by our organization in cooperation with the various highway authorities. These organizations are internationally recognized and can therefore also bring their influence to bear at international level. We are talking about road accident statistics in relation to road safety policy, and although Mr Andreasen has said : "As a statistician, I find it difficult to speak about road safety policy", I think we must be absolutely clear that this is the object of our efforts. In this context, as a means of stimulating and influencing today's discussion, I should like to refer to two aspects of road safety policy. Road safety measures will be geared more and more to the behaviour of road users, although it is extremely difficult or impossible to keep a check on this behaviour. The safety belt is a case in point : it is extremely difficult to ascertain whether or not they are worn, but we must nevertheless induce people to wear them. The same applies in all countries as regards the observance of speed limits.

I believe, therefore, that if we are to influence people properly, the statistics must be readily available. This I consider to be an important requirement.

In the second place, I wish to point out that road safety policy will include more and more planning measures. A recent policy memorandum issued by the Netherlands Government refers to such matters as a restriction of traffic performance, the influencing of the choice conveyance towards safer means of transport - public transport, for instance - and dividing our residential and working areas into districts where traffic is given first consideration and districts where living and leisure are given first consideration.

I think we may conclude from this that it is necessary to see road accident statistics in the light of other, more general, statistics such as the number of kilometers covered by each mode of transport. There should be sufficient knowledge of all the demographic data concerning the number of inhabitants.

Previous speakers have said that in this field of statistics the compilers and the manner of compilation are one of the most important factors - if not the most important. In his report, Mr Andreasen mentions the police as being the basic source of all the relevant statistics in Denmark (though he suggests that this may also be the case in all other countries). It is the police who record the fundamental statistics data from which all the various statistics are ultimately compiled.

I believe that this is an extremely unsound basis. The Netherlands is probably not the only country in which the police force suffers from a chronic shortage of manpower. We can also assure that the police give little priority to statistical and administrative tarks; they have other things to do which are far more important and which, should the need arise, will always take precedence. Furthermore, the police in the Netherlands - and, I would think, in most countries - is a decentralized organization. This means that the uniform definition policy, which has been referred to by many of the speakers and which is absolutely necessary if these statistics are to be of any use, is extremely difficult to realize because of the decentralization of the police force. Finally, I would point out that the interpretation placed upon the facts by the persons who record the accidents is obviously a very subjective matter.

In the past 10 years in the Netherlands, the instructions in accordance with which the police complete accident forms have been changed five times. The statistics show that the incidence of these charges on the number of accidents recorded ranges from 5 to 15 %. One such change, consisting merely in the completion of a second copy, resulted in an 11 % decrease in the number of accidents recorded. Consequently, in the Netherlands we are searching for organizations other than the police who can give us a better and more complete picture of the number of accidents. We are trying to arrive at a form of cooperations with the insurance companies but this has not yet been finalized. To conclude, I should like to dwell for a moment on the three levels at which statistics are compiled.

The local and regional level at which the three different types of statistics mentioned by Mr Andreasen - police statistics, medical statistics and vehicle statistics - should be collected, present, in my opinion, serious problems because at local level there is insufficient knowledge and expertise available for the collection of these three types of statistics and because insufficient use can be made of them. I believe, therefore, that we must acknowledge at the very most, that, only the police statistics are usable, applicable and at all realistic in the local and regional situation.

At national level, I consider all three types of statistics to be important, and they should be catered for by a programme which will probably take a number of years to realize. I should like to propose an alteration to the priorities given in Mr Andreasen's report. I think in the first place we should try to achieve a minimum acceptable level of quality in all three types of statistics. Since we are dealing with all three, it is essential that any organizational problems be solved. In the second place, we should improve the quality of police statistics. I should then like to see medical statistics ranked as third and vehicle statistics only as fourth. As the report tells us, the major problem in the case of national statistics is not the processing of the volume of data - which may be enormous - but rather the coordination of the various systems. And although I have only mentioned three, there will probably be many more systems which will have to be integrated at national level. At international level, I do not consider it necessary to try to arrive at detailed and differentiated statistics concerning the nine Community countries.

As user organizations we would be far better served if the national statistics could be rendered comparable. In that connection, I believe that first priority should be given to determining the minimum set of parameters to be adopted in the basic statistics about which Miss Sabey spoke. We should try to determine these parameters jointly and define them clearly.

Intervention by Mr THIRY

It will not come as a surprise when I tell you that the insurance industry is keenly interested in road safety, and that for some years it has been taking an active part in drawing up statistics to help in reaching decisions on road safety. I might remind you that within the European Insurance Committee there is a Commission of road safety. This will give you some idea of the importance that we insurers attach to safety on the roads.

There is no doubt that the preparation of comparable statistics as between one country and another is a difficult matter, and we owe it to ourselves to support any attempt to establish the truth concerning the causes of road accidents. As you know, however, it is far from easy to determine the part played by various factors in the occurrence of accidents : is it the infrastructure, is it the vehicle, or is it the driver ? How much of the blame attaches to each ? I scarcely think that we shall be able to solve this problem today : before we can do so, we shall need full and detailed statistics, and shall doubtless have to do some factor analysis and model-building as well.

In the research that has been presented today, notably by Mr Andreasen in his excellent report, there is something that I find very interesting namely the search for objectivity in determining the causes of accidents. He tries to achieve this by a graphic objective analysis of the position of the vehicles before the accident. At this juncture, I ought to say that as an insurer - first a Frenchman and secondly a European- I have had the opportunity to take part in an experiment carried out by insurance companies in an attempt to find an objective approach to determining the causes of road accidents. At European level, there has been an innovation of which everyone here may now be aware : this is a European accident report describing the situation of the vehicles before the accident. For we insurers, this is of great importance as it leads to a graphic reprensentation of the accident and thus permits greater objectivity in the interpretation of the causes and circumstances surrounding it. This idea of objectivity is found in this informal report, which makes it very easy to determine the persons responsible for the accident. To this extent, the ultimate aim of the exercise, which at first sight appears fairly similar to that of our Danish friends is in fact different since it is merely to ascertain who is responsible. However, I feel all the same that it is an interesting approach to an objective analysis of accidents.

If I might go a little deeper into the use of this informal report, I can tell you that when it reaches the insurance companies who have to analyse the accident files, it gives them the key to a whole range of liability factors which cover most cases of collision between two vehicles (99 %). They include a good many of the items I have noted in Mr Andreasen's report, e.g. the position of the vehicles, whether travelling in the same direction on the same road or in the opposite direction, those coming from two different roadways, vehicles entering a roundabout- in short, a lot of factual information that can be easily coded to describe an accident situation.

I wonder whether precise graphic illustrations would not be more conducive to understanding between countries than long questionnaires. As a statistician, I have had the task of utilizing this information, which is merely the statistical by-product of a system whose main purpose has nothing to do with statistics. I can now begin analysing the causes of accidents and above all the cost of repairing vehicles. Of course, this whole system of ours is only intented for the study of damage to property. It has not been extended to cover bodily injury, as the scale of liabilities adopted is a conventional one which is valid only between insurance companies and has no legal force. Nevertheless, the French courts have often referred to this conventional scale in cases of disputed liability; I think, therefore, that it might well serve as the basis for establishing liability.

With regard to the use of the proposed statistics at the level of the European Community, I have only praise for the project of making such statistics comparable. As a great user of statistics at French national level, I am in constant touch with the public statistical offices which supply the statistics on road traffic, in particular SETRA, which is the parent body of the National Road Safety Office represented here. These bodies know how much I need statistics. At international level, even if the figures are not perfect or entirely comparable from one country to another, I think that any statistician will find them of great interest and may even discover in the results things that he would not have dreamed of at the outset. I feel that we should not reject this initiative which the European Community has taken in trying to obtain data which is at any rate roughly comparable in the various European countries.

Intervention by Mr MAYER

Mr Mayer thanked the members of the panel and said they had all adopted the line he had hoped they would.

He added : At the beginning of my introductory address I askel them to try and establish a scale of priority, to circumscribe what has to be done, and I admit that this in fact has been the fairly general trend; I have high hopes that this evening we will depart with a clear idea of what must be done first at Community level, and perhaps alsc at other levels. I therefore throw the floor open to the members of the panel : perhaps Mr Andreasen would like to speak since some comments were made on his report and contribution.

Intervention by Mr ANDREASEN

I think there are two points which again emerge from many of the contributions from the panel. They are two points which I hope also emerge from the Paper. The first is that very high priority is given to data reliability in international statistics and surveys of data on traffic accidents. We are anxious not to make the international systems too complicated, because we expect this to introduce a degree of unreliability into the data contained in the statistics. Also there is the fact that, if the statistics are made complicated, differences in background variables, such as in particular, infrastructures and different rules in different countries, will play a bigger part, and I entirely agree with that view. admit that the proposal I set out in annex 2 to the paper is a purely personal assessment of what would be possible under Danish conditions. It may well be that not all countries could do likewise and many panel members were of the opinion that we definitely could not count on it. I think that, rather than delving into the details of the proposal, we should look upon it as an example of the type of method which can be used in international cooperation in this field. I would mention one thing which is of crucial importance in this connection : that is that it would be possible to build up some form of data bank using matching data from the various countries, so that countries - especially the small ones - would be able to supplement their own data with the corresponding data from other countries. But this clearly requires that the various countries use the same definitions and invest the factors under scruting with the same content.

The question is therefore, when these international surveys are carried out, where is the limit to be set ? How much is to be included ? And shall we, after this discussion be obliged to set the limits so narrowly that the users of the statistics have doubts as to their usefulness ? Indeed, we then again have to consider whether it is at all expedient to work with such a system.

Another point which many speakers touched upon was the need for detailed information, the need for background material. Dr Hartmann said that he would like to have some additional information on the vehicles, and other speakers expressed wishes for road information, i.e., infrastructure information. That is indeed one of the areas in which traffic accident statistics are traditionally weakest. It is also something which we have left to other statisticians, and it is indeed an area in which we must intensify cooperation on a national level in order to have this background information compiled in a responsible manner as regards traffic accident statistics. It is to be assumed that this can only be done on a national level, or perhaps we should go right down to the regional level in order to undertake this detailed comparison of background material and traffic accident material. Therefore many say that it would be excellent if this could be done on a national level, if only the sets of national material could be compared. There is no reason why it should be processed by one or other of the international organizations. But the problem is how do we reach a position where we are able to compare the sets of national material ? Are we not going to run into a whole series of difficulties here, in that each party devises his own system which differs from the others and which may be difficult to compare with them ? I might point out that we ourselves, in a small country like Denmark have experienced difficulty with local areas here and there adopting different systems - and indeed, taken individually, thoroughly sensible systems - but they were not comparable with one another, that is not until requirements were imposed on a national level for uniform methods of reporting.

Commentary by Miss SABEY

I would be interested in having more comments on how one overcomes the difficulty of describing the different environment in different regions, whether they are parts of the country or whether they are different countries. Because unless we know the distributions of different types of road, different speed limits, different types of vehicle and so on, we are not going to be able to weigh the statistical data we collect, in the way Mr HARTMANN described in order to give reliable comparisons.

Commentary by Mr BAGGENDORFF

Making international statistics does not only mean establishing tables to be published in some international statistical yearbooks. It is of course an element, where the reader normally learns what the international organizations are dealing with, but in addition to this it is much more important to organise discussions with the statisticians who are responsible for compiling, collecting and creating the statistics in their national field in order to exchange views and experience and to find some standards on which everybody could agree or which could be built into the statistics, in a time ahead as Mr ANDREASEN has mentioned : when a change has to be done in a country, some of these internationally agreed standards could be introduced in the national system.

There were different problems mentioned by the panel members, i.e. the definition of killed, injured, subdivided again into slight and heavy injuries. The ECE - Economic Commission for Europe - has been discussing it for many, many years. In that forum where so many countries are participating, one can only reach very broad agreements acceptable by all the member states. In a smaller international forum like the European Community, where the differences between states are not so big as in the whole of Europe, we cannot break this definition of 30 days, but we maybe could find some agreements on certain subdivisions and in this case one might convince the other member states inside the Economic Commission for Europe to adopt some of these subdivisions.

This is one of the activities of an international body, where this exchange of views can provide better definition or some subdivision, everybody in principle could agree on. It is not only the question of definition of the size of accidents and personal injuries etc., but even of some of the standards as Mr ANDREASEN has pointed out in the report, i.e. certain elements or descriptions of accidents in causes, or in this case better in situation, leaving the possibility of national subdivision according to national interests in each country.

This is in my opinion the most important task for an international body. As a result of continuing discussions some tables will be drawn up - international tables published in the international publication - where the reader gets some information. This information could never be as detailed as it will be on a national level, of course it would be an enormous book if we put, for example the details of nine countries together in one book, in which one would drown. This is a question of balance, and it would therefore help us very much, if, in the discussion, the participants could point out the elements they are missing in the international tables, especially for the nine countries, where we should go in some more details, although everybody can agree that we cannot give as much detail as one could do on national level.

General DISCUSSION

Mr Mayer opened the general discussion.

Intervention by Mr Petruccio

Mr Chairman, I do not wish to say anything about general method, but simply speak on a matter of detail, namely, the desirability of gathering data on the safety belt.

Intervention by Mrs Van der Does

I agree entirely with Miss Sabey that it is very important to know what data we need.

One of the data which has not been considered concerns road accidents involving children. We would like an answer to the question; was the child on the way to, or even more important, on the way from school, which be in the afternoon ? It is often thought that the time of the accident can be deduced from existing statistics, but, in an international context, this is not possible because customs vary from country to country. It is difficult even in our own country because all schools do not end at the same time every day. The organization which I represent would therefore be very much obliged if some attention could be devoted to this matter.

Intervention by Mr La Cour

My name is la Cour, of Denmarks Statistik.

I should litke to take this opportunity of saying thank you to the Community for having taken the initiative of holding this seminar, dealing as it does with such an important and - in my experience - extraordinarily difficult field. One of the difficulties, in my opinion, is that of devising a systematic method of dealing with the problems surrounding traffic accidents.

In my view it would be an advantage if the problems of the statistical reporting of traffic accidents were to be divided up into several sub-groups. A month ago, a symposium organized by the World Health Organization was held in Vienna on the subject of traffic accidents from a medical and health point of view. This approach is clearly of the utmost importance, especially when it is a question of elucidating the health and social consequences of traffic accidents for the victims. Satisfactory coverage of this area is only possible through an improvements in the statistics dealing with the treatment of casualties in hospitals, casualty units, etc. This information, however, cannot be obtained from police reports. Cooperation between the health statistics office and the police in the reporting of accidents would thus be particularly useful, but it is important to remember that neither health statistics nor police reports alone can give sufficient coverage.

I also consider it essential that the compilation of statistics be pursued as two separate tasks, but in such a way that maximum coordination can be secured. This also applies to a large extent to the coordination of the work that is being done in this context in WHO, ECE, OECD and the European Community.

I consider it equally essential that the users of statistics should be clear in their own views about what they want. As statisticians, we should endeavour to meet the reasonable demands of the users, but the discussions on accident statistics often proceed on very divergent lines, partly because no sufficiently clear distinction is made between the type of information needed; at the same time, it is not always borne in mind that the health sector cannot supply the basic data relating to the circumstances of the accident, etc., while the police, on the other hand, cannot supply more detailed information concerning the nature of the injuries and the specific consequences of these injuries. Added to this is the fact that the police are not notified of all accidents, while the hospitals can achieve a much broader coverage of the total number of casualties.

This, however, does not mean that the two sets of basic data, emanating respectively from the health sector and the police, each functioning in isolation, cannot throw light on important aspects of accidents. Accordingly, the health sector can give information on the human consequences, while police reports indicate the course of events and the technical circumstances under which the accident took place, etc.

Against this background, I consider it important that the statistical treatment of traffic accidents should be structured in terms of what is required, in that sufficient distinction needs to be made between the accident situation and the circumstances attendant on the accident as one main problem and the human consequences of accidents as the other. This should also make it possible to arrive at a more general treatment of the general social consequences of traffic accidents, and perhaps this would provide a better basis for assessing in what manner and to what extent measures to reduce accidents need to be taken in the police procedure design, and road construction fields.

Commentary by Mr MAYER

I believe that a very clear distinction was made this morning between two types of statistics : on the one hand, the statistics that are called basic, and on the other, statistics in depth.
Basic statistics are never very easy to define. This distinction was made both by Miss Sabey and by Mr Andreasen, but it seemed to me that they were not completely in agreement on this point. I believe that basic statistics are characterized mainly by the fact that no attempt is made to define precisely what they are for. Mr La Cour called upon us to find out what the users want; my answer to him is that very often basic statistics have appeared before it was known what they could be used for. Price indices are compiled in many countries, and they were compiled for years before they were used for sliding salary scales or for medium-term forecasts; similarly, industrial production indices were calculated well before they were used to establish forecasts or expressly for the guidance of economic policy.

It was information in the same way, demographic information, indeed, which was useful. This way of looking at it seems to me quite justified, for I would call your attention to the fact that statistics are always a heavy investment. We must thus work while bearing in mind, not only what the users want now, but what will be necessary in five or six years. Five or six years hence it will not be possible to set up a statistical system overnight. The fact that the statistical investment is heavy must always be kept in mind, particularly when the statistics are the by-product of activities which are not statistics. If, in fact in a few years time, because the motor vehicle market has become even more international than it is today, the Community is assigned by the Member States the task of determining the international safety rules - transport being by its very nature very international - it will need statistics that we should be preparing today. This is what basic statistics are, those that may be considered useful in any case. From this point of view and where we are concerned, we are ready...

I should first of all like to draw your attention to gratuitious harmonization as well. I am referring in particular to those who told us to be careful to avoid pointless forms of international harmonization. I share their opinion, but on the other hand, if we think of what I have just said, when the harmonization is, let us say, very low-cost, when it requires very little effort, there is no reason not to do it - not with the aim of publishing enormous volumes, but rather in order to provide for its use in a few years' time. I can give a very simple example, drawn from other statistics but which perhaps applies here, i.e. statistics on population by age group, the limits of which differ from country to country. This fact alone, which contains some element of uncertainty, leads to statistics that are totally unsuitable for comparison. Here, then, we have a case in which harmonization would not cost very much and in which it would certainly be very useful. Another example that has frequently come up this morning is that of the definition of a fatality and of an injured person. It should be realized that this is not just a pure convention, but that it depends on the base or difficulty of obtaining the relevant data. This, then, means going a bit further, it makes an expensive business, but it might be something really worthwhile.

Another aspect of this particular matter that concerns us is that it is fundamental for us to know accurately what forms of action have to be taken. I should accordingly like you to specify for us the points on which you consider that we should concentrate all our efforts. That is what I wanted to say on the subject of basic statistics and gratuitous harmonization.

As regards the analysis in depth, I quite understand that wherever an analysis involves a large number of variables, it cannot be done at international level. I would even go further than what has been said this morning, since international surveys show us that when the aim is to define a certain number of characteristics, it is infinitely more difficult at international leven than at national level. This can sometimes be only a question of vocabulary : for example, in France, we know what a "route nationale" is, but internationally this does not exist; likewise, many social security rules are well known to the French and perhaps enable problems connected with hospitalization or other such problems to be simplified, whereas at international level everything has to be defined down to the slightest detail. You recalled that collection of data is never very efficient in this field, that it is never done by statisticians, nor done for statistics. I truly believe that research that requires the introduction of many variables cannot be conducted at international level. We have been told, this morning indeed, that it is already difficult enough at national level. Mr Andreasen, however, has directed us towards a path which consists in studying particular regions the structure of which is common to various countries and in respect of which a special effort could be made which would be profitable. This is a point which will need studying.

Perhaps there are studies, which could be called "studies in depth", that do not require the introduction of many variables. There are cause-and-effect relationships which are simple, and which involve only a few variables. Here it is obviously worthwhile obtaining a sample that covers the Community as a whole. I would accordingly ask you to clarify for us, on the one hand, the possibility of organizing at Community level specific studies of the type referred to by Mr Andreasen in Figure 9 of his paper, that is, accidents on mountain roads, whether they are in France, in Germany or elsewhere; and, on the other hand, whether there are not any cause-and-effect relationships that we can effectively attempt to discover at international level.

I propose that the discussion be concentrated initially on the question whether the objectives that the Economic Commission for Europe has set itself are judicious and whether our first objective should be to have these applied by all our Member States.

Intervention by Mr Margara

My question concerns two points which have in fact been covered fairly fully in Mr Andreasen's report since I sumitted my request for speaking time. Anyway, I agree on the need to give absolute priority to the task of standardizing throughout the Community the lapse of time which must be taken as a reference when assessing the number of deaths and the number of serious injuries, and secondly the task of defining and standardizing what is meant by serious injury. These two ponts, in particular, were given emphasis by Professor Graffard, and I think they are fundamental points because they are the figures which are supplied or requested most frequently and before all others. In fact there are three figures at issue : the number of deaths, the number of serious injuries and the number of slight injuries. For any future study it is important to compare such figures in the same way as we have done from the statistical records of the various countries. However, we will then be faced, as has already been stated and as I wish to emphasise by serious problems of comparability. In Italy, for instance, the deaths have been assessed over a time lag of 3 days and, since 1974, if I remember rightly, over 7 days. In Holland, I think they are assessed over a period of 30 days, and in Belgium over during the accident and transport to the hospital.

Owing to these inconsistencies it seems clear that it will be difficult for the users of such figures to establish parallels and to determine where any measures taken to contain accidents are most effective. I do not know what assessment is used in the United Kingdom or in France. It is clear that the time lag should be standardized for assessment purposes. Secondly, what is meant by slight injury ? In Italy, a slightly injured person is one who is kept in hospital for 40 days after traffic accident. This may be too much or too little. It is not for me to decide but it is clear that me must have a standard reference in this case too.

Intervention by Mr Mayer

A question for Mr Andreasen. I had in fact not added that this point about the harmonization of the definition of a fatally injured person, which I felt was fairly basic, did not appear in your report or, at any rate, that you had not drawn our attention to it.

Was this because the context was not suitable or was it because you thought that it was not a point which should be discussed since statistically it is possible to go from the number of deaths in 30 days (one month) to the

number of deaths in 7 days (one week) ?
Could I ask you to give your opinion on this point ?

Commentary by <u>Mr ANDREASEN</u>

The reason why I did not join in the discussion on definitions of fatalities and serious injuries, as has been mentioned here, is that I do not think I can contribute anything new to the discussion, which has after all been taking place for many years in Geneva. I will say, however, that I think we should refer to it specifically as a discussion on the period between the occurrence of the accident and the recording of death, i.e. a discussion on the point at which the line should be drawn between recording as a serious injury and recording as a fatality. This discussion - regardless of the fact that it is has so far failed to induce everyone to apply the same criterion - has indeed shown the usefulness of an international forum, in that, through the work which has been carried on in Geneva, we have established certain relationships to which Mr Graffard has also referred. We now have some knowledge of how many victims die within certain intervals, e.g. the proportion who die after 24 hours, the proportion who die after 10 days, 14 days, and so on, so that for all practical purposes we are able to convert the figures obtained from countries with differing definitions to a common standard : and that, in my opinion, is a very important achievement which has been reached through the discussions held in Geneva. I think that perhaps that is something we can also achieve when dealing with other factors in respect of which we all have different standpoints to start with but may possibly be able to work towards certain main groups and agree on what significance is to be attached to them. In this connection I am thinking in particular of those accident situations of which I have already given an example. Some countries apply 100-200 different situations. In Denmark at present we have 73. This number will be reduced in the new system to about 60, but it will be possible to arrange these in 10 main groups. Here indeed, one could imagine other countries perhaps wanting to use only 10 main groups, and some perhaps that would want to adopt 30 situations, but as long as it was possible always to break them down into these 10 main groups, we sould have achieved a basis for comparison. Where fatalities are concerned, a basis for comparison of the kind I am actually referring to was achieved through the discussions in Geneva. I can easily understand that it is difficult for countries suddenly to change their definitions, and I also think that we in Denmark shall have misgivings if the limit is reduced to three or seven days, but I do not regard the fact that we all apply different definitions as a particularly serious problem in practice. I might mention that in Denmark we actually apply two different definitions of fatality. We apply a 24-hour rule, i.e. we ascertain how many victims died within 24 hours, and obviously we can do this very quickly after a certain period, say after one month, has elapsed. Thus we draw up a set of statistics on this basis, but we do not send these figures out until we have adjusted them. We have in fact found from experience over a number of years that, when a certain number of serious injuries have been entered on the form used for this coverage after this 24-hour period, a certain number of the victims will die within 30 days. All we do, therefore, is to convert the 24-hour figures to the 30-day criterion, and these are the figures we send out. They are thus reasonably comparable with the final figures - i.e. the figures produced strictly in accordance with the definition - when they are obtained in due course. This is surely an example which shows that it is possible, even at national level, to apply two different definitions and still obtain comparable results from them.

I do not know if that was sufficient to answer the question, but I have given some of the reasons why I did not participate more fully in this discussion.

Intervention by Mr DIELEMAN

For five years we have been preparing annual statistics on accidents in the Member States of the European Conference of Ministers of Transport (ECMT) - 18 Member States and a number of associated countries - for the Road Traffic Committee of the ECMT.

I believe - and here I am associating myself with the opinions expressed by Mr Andreasen - that the problem of defining a fatality is, actually a spurious problem, since the accuracy that can be achieved by means of corrective factors is, in the final analysis , much more precise than the random variations surrounding the number of people killed. It is certain that the number of persons who die within 30 days after the accident varies considerably according to the source of the data. I believe, in addition, that what interests us from the international point of view is not so much the absolute figures, but their relative magnitude. I can tell you that at present - and this has been the case for years - the number of fatalities within 30 days per million inhabitants in the 18 Member States of the ECMT (countries that are comparable from the point of view of motorization) varies between 127 for the United Kingdom and 340 for Austria. This means therefore that, for countries with a similar level of motorization, the number of fatalities per million inhabitants varies within a range of 1 to 2.5. It is interesting to note that this range changes very rarely, even if draconion measures such as speed limits and the compulsory wearing of safety belts, are introduced, as has been done in Belgium, since, although these measures result in a 20 % decrease in the number of fatalities, they have no effect on the range, the other countries having taken similar measures in the meantime. Another factor that counts is the distribution of the results according to the aspect that you wish to study, e.g. pedestrians, two-wheeled vehicles, etc. It is certain, for example, that in some countries the moped presents no problems, being involved in only 2 % of the fatalities, whereas in other countries, such as the Netherlands, the figure is enormous. Many more pedestrians are killed in Britain than in some other countries.

I accordingly believe that the distribution and trend of the data are more important than the mathematical accuracy of the results.

I believe, also that the trend in the number of fatalities, although made much of in the press and at political meetings, is less significant than that in the number of victims, since the number of fatalities is excessively dependent on random variations, having been considerably reduced in most of the countries represented here.

I have ECMT reports in which an attempt is made to establish the influence of motorway speed limits. Some countries, including Denmark and the United Kingdom, have judiciously pointed out that, since the number of fatalities on motorways is very low, the value of the results is not very significant ant it was necessary to resort to the change in the number of victims. It is obvious that by so doing one covers information relating to the gravity of the accident. In the light of experience I believe that, with a few rare exceptions, accident trends cannot validly be studied on the basis of the number of fatalities, but that only the total number of victims should be taken into account.

My second remark, still with regard to victims, concerns the criteria used to define an injured person. If the relationship between the number of fatalities within 30 days and the number of victims is calculated, inexplicable and considerable differences are found from one country to another. I believe that these differences stem from a lack of uniformity in the definition of an injured person according to gravity of injury, which explains differences that sometimes amount to as much as a factor of two. It would thus desirable for each country, when forwarding its figures, to indicate also the definitions used, showing, where necessary, any discontinuities in the application of these definitions and the conversion factors that the countries possess.

To conclude, I should like to talk about age groups, the system of which is very complex. Harmonization on EEC lines would be difficult. Let us take an age group of 15 to 20 years. In these groups, whatever they may be, you lose an enormous amount of information : with regard to mopeds, for example, the peaks in the 16, 17 and 18-years age groups in countries where one is allowed to drive at 16 are not brought out.

Let us take, in addition, a classification of children between 5 an 14 years old : as the problem arises at 7 or 8 years of age and then decreases, this information is lost in the case of such a grouping. What, then, is the solution ? I do not know, since if you don't group you have too much information, and if you do group there is a risk of losing essential information.

That is why I tend to favour the "basic statistics" point of view, provided that these statistics contain results in absolute figures and in percentages, knowing that, for practical studies, it will be necessary to turn to certain countries with clear definitions to ask them for the very precise details that will be needed.

Intervention by Mr BAGGENDORFF

May I just give the comment that, out of the nine member states, seven use the '30 days' rule for killed persons and only two states are using six and seven days. These two member states have also provided the conversion factors needed to make an estimate of the total number of killed and injured persons. These overall figures should be sufficient to follow the trend of casualties as a whole as well as to calculate some relative figures. I draw however your attention to the fact that conversion factors have to be calculated separately for each country, while experience has pointed out that important differences appear between countries according to geographical or climatological characteristics and that, even then, these conversion factors cannot be used for certain breakdowns : it is for instance evident that the mortality of victims under 20 years old will not be equal to that of others which are as old as let us say 70. There are differences. But if more conversion factors could be calculated with the help of medical statistics, I think we would have reached our aim in a practical way.

Intervention by Mr LEDRU

I wanted to concur entirely with what was said by the Belgian representative a few moments ago, because I think that the question of definitions, which has been discussed for almost 20 years and in respect of which no understanding has been reached, is an important problem, but one on which hours, or even days, can be spent without arriving at any harmonization. I should like to revert to what was said a short time ago, when it was mentioned that certain minor harmonizations did not cost much. I do not agree at all, since harmonization is never free, and in a country which has computerized accident files going back 10 years, changing, for example, a comma or a code on a form would entail additional costs of the order of tens or even hundreds of thousands of present-day francs. Harmonization is thus never without cost and I think that, before embarking on that way seem to be matters of detail, it is necessary to be very careful. I, for my part, consider that, with regard to basic statistics, which we have just been discussing, it is sufficient to possess means of correction in order to succeed in producing coordinated statistics for a group of countries, provided, of course, that we know what is going on in the various countries. I also agree with my Belgian colleague that, for each specific study, it is necessary to carry out a pilot study on the basis of a specific questionnaire and to go back to the sources.

Intervention by Mr GRAFFARD

The brief report that I presented this morning evoked more reactions than I hoped for, which pleases me.

I should like to state first of all that I did not speak as a specialist in road accidents, which unlike many of you I am not, but as a specialist in epidemiological methods. Epidemiology is the science that deals with the districution of ailments in human populations and with research into their causes. This is a science which is, of course, based on the other medical sciences and on the science of statistics, but which, and this is not often clearly perceived, uses methods which have been developed during the last few decades and are peculiar to it. A curious thing is that these special methods have had less impact, or at least a later impact, in the field of traumatisms, and more particularly road accident traumatisms, than in other medical fields such as heart discase, bronchopulmonary ailments, and, of course, infectious diseases in respect of which the use of epidemiology is of longer standing.

One of the primary requirements in any sort of epidemiological comparison is the existence of definitions that are as clear and as precise as possible and on which everyone is in agreement, and the use of methods as similar as possible so that the comparisons are valid. It is clear from the discussion this morning that this stage has not yet been reached where definitions of traumatisms are concerned, whether we consider fatalities or injuries. It is also clear that the use of strictly comparable definitions and methods will not come overnight. However, I could perhaps suggest the use of a technique which has proved successful in other fields : Member States should be recommended, not to give up their existing habits, which would greatly inconvenience them for the most part, but for some number of years, to use alongside the definition proposed earlier by the European Communities the definitions to which they are accustomed. The simultaneous use of the two methods would enable them both to continue comparisons within a few years.

Intervention by Mr LEDRU

I think that keeping two sets of statistics simultaneously is impossible, first of all because there is a risk that those responsible for recording the information would mention either one set or the other, but not both, considering that there was always too much work involved; secondly, because at the data - processing stage - as I said this morning - this would necessitate a double output for the whole set of information, which increases the cost; finally - and here is the main difficulty as regards changing the definition of a fatality - because the departments that complete the statistical forms refuse, in the case of France, to extend the observation period. We have here a relatively large number of accidents. The present definition requires us to observe the victims for seven days, after which the forms are sent off. With the 30-day definition, it is necessary to repeat the survey after one month, to revisit the people involved and to acertain their condition, whether they are dead, gravely injured, etc. In the present circumstances I think it is unrealistic to want to induce countries that use definitions other than that adopted at Geneva to record this double set of information.

Intervention by Mr MAYER

I propose to revert to this question of the possibility or impossibility of changing when the conclusions are discussed. I think, Mr Ledru, that one can always change; others have done it but it is expensive.

I should like to classify the rest of the contributions in three parts. Firstly, some of you want to come back to the substance of the central problem, that is the need for statistics, which will help us to define those that we require; then there are a number of individual questions raised in these papers and it is also possible that we may return in detail to a number of points brought up this morning. Finally, some of you have proposals to make on the continuation of the work.

Intervention by Mr KNIGHT

I should like to speak as a tax payer as well as a motor car engineer, because it is after all the tax payer, who will pay for any accident statistics system that we care to think up. I would like to develop a point, which Miss SABEY made about the use to which the statistics should be put. It seems to me that it is not a question of what statistics we would like, but what statistics we really need, or - put in another way - what statistics we can really afford. The main function of accident statistics in the ECE and EEC should be to indicate what future legislation we should have, and it follows therefore that without the justification provided by accident statistics, we should not have legislation. Therefore, those responsible for making the regulations should state what statistics they require to carry out their function, and it seems strange to me that this particular session should come near the end of the seminar, and then only as an alternative to sessions on pollution and the use of materials.

I should welcome the views of the panel on those points.

Intervention by Mr HOPPENBROUWERS

My name is HOPPENBROUWERS, and I work with General Motors Continental here in Belgium, and as such I am an observer, here in this symposium as well as in the seminar, of C.L.C.A. - Comité de Liaison des Constructeurs de l'Automobile.

I would like to endorse what Miss SABEY stated and repeated with emphasis : the need to agree upon and define the objectives of these statistics, and in particular I would like to refer to two of the objectives she listed, one being 'assessing the risk of vehicle components' and the other one 'assessing the effect of regulations'. I am repeating a little bit of what Mr KNIGHT said, which proves that we are taking the same course, but indeed while it is realized according to the statistics that the vehicle itself is not at all an important part in the causation of accidents. We would nevertheless like to emphasize the need for proper statistics on the contribution of the vehicle and its components and systems in the reduction of accidents as well as injuries, because the small part of the accidents caused by the vehicle is 100 per cent our concern, and we would like to improve the vehicle in the future. Such statistics would help two parties : it would help the 'Barriers Group', whose first objective is to eliminate barriers to trade. Whether they like it or not, they are very deeply involved in rule-making on vehicle construction to reduce accidents and to reduce risks. They would be served by statistics, that lead the way to proper directives. It would also help industry in guiding its initiative and creativity in designing future cars. It would confirm or reject the conclusions reached by research and testing in laboratory or on the test contribution, or lack of it, of the vehicle system components (the vehicle as a whole even) in the reduction of accidents as well as injuries.

Intervention by Mr THEESDALE

My question reinforces the first two questions of my colleagues.

It was said this morning that the basic need was for statistics on the problems of the highway system in general to form the basis for better legislation, when legislation is found to be necessary. For the motor manufacturers' point of view, when we come to detailed investigations, it is essential to know which particular vehicle has been involved in the accident, and when we look at the proposals not only in the Danish report, which I agree is very good and a very useful one, but also in others, the identification of the particular vehicle is usually inadequate for us. For example, the registration numbers are given, but particularly at this time of economic problems, a vehicle may be newly registered,but may well have been manufactured a year, 18 months or even two years earlier. It is no great help for the manufacturer to be told that the vehicle was newly registered, because perhaps he assumes that it is a new built vehicle, which incorporates certain extra features, for instance head restraints, which vehicles a year or two years earlier did not have.

It is essential for us to evaluate the effectiveness of individual features, therefore we must know if this vehicle had such a feature or not. So my first point is, although every user of statistics could demand more specific detail, we would ask for a means of positively identifying the vehicle in the case.

The second thing I would ask is that, if it is possible, the researcher on the spot who is, gathering the data of the case, should indicate, if it is a popular production model, whether there has been a gross modification to the standard features. By which I mean that we need to know if the vehicle is normally equipped with head restraints of an adjustable type shall we say, and if these have been removed, or if the vehicle is plainly a hot rod, because it is little help for us to be told that it is a current Escort, and ten, when we get the case, eventually, find out that someone has put special seats, an enormous engine, and so on.

Commentary by Mr MAYER

We have just heard three comments from representatives of motor manufacturers asking us for a certain type of statistics; did not our discussions this morning give the impression that the statistics they are asking us to prepare for this type of analysis cannot be produced at the international level ? Is this not an area in which international standardization is still a very remote prospect ? I am thinking of vehicle components and even detailed descriptions of vehicles. I believe that, having regard to this desire, we shall soon have to determine at international level, at Community level, what type of details will be of service to them and will provide a collection of reliable information.

Intervention by Mr DIELEMAN

It is my belief that one problem that renders the solution difficult is the fact that we here represent several sectors and that we all have our specific problems. Since the manufacturers are the best represented, we have dealt above all with their requirements.

I fear that we are mixing several types of statistics. There are national and international statistics; there are mass statistics and specific statistics, and both of them can be either national or international. We find moreover, that we have mass statistics in every country in which accidents are recorded by the police authorities, that is to say by people who do not specialize in producing statistics and who have other things to do, such as ensuring that the ground is cleared so as to prevent further accidents. They are thus neither highway engineers nor automobile engineers. Hence we have here an initial restriction in respect of mass statistics.

The accident data are then recorded in a computer, which produces for you the systematic national publication regularly containing the same tables. In addition to that, you can have specific requests in the country : if, for example, you introduce a speed limit, you analyse the specific data at your disposal. Currently, at the international level, there is the publication of the United Nations at Geneva, and the rest are statistics that I would call mass statistics. It is very obvious that, at the international level, the manufacturers need specific comparisons, and these cannot be provided by mass statistics.

This was the case, for example, with the CCMS programme (Committee on the Challenge of Modern Society) of NATO, in which the group concerned with accident analysis, particularly from the biomechanical point of view, sent the States concerned a very detailed statistical questionnaire in which the criteria, definitions, etc. that had to be used were explained.

However, this was a specific international study which had nothing to do with mass statistics and I believe that it would be illusory for the manufacturers to believe for a single moment that they would obtain valid data by using the mass statistics recorded by the police. The fact is that, even when it is possible to connect the accident with the vehicle (it is surely necessary to record the registration number of the vehicle and to have access to a vehicle file), you will not necessarily be able to put the blame on the vehicle, since you do not know what use was made of it. I believe that, too, is very important.

I therefore consider it imperative for the Community to define very clearly the objectives it has in view, and I believe that in the initial stage it will be virtually compelled to confine itself to collecting national mass statistics by requesting the national statistical institutes to provide it regularly and systematically with very accurate data so that they can be published just as regularly.

Intervention by Mr PATRICK

The previous speaker probably answered some of the points that I wanted to make, namely that from a biomechanical standpoint it would be very helpful to have some data on the collision's severity, some of you will know that the injuries that occur, in a severe accident or in a not so severe accident, so that we can use the data for obtaining quick and accurate information on the effectiveness of certain safety systems such as the restraint system. As I pointed out earlier in the week, we worked on a program on railroads where we study in detail the collision's severity, and matched these with the injuries and then duplicated the results in the laboratory to get some tolerance levels. If that could be included in these statistics, I think it would make them more meaningful, but perhaps with the massed statistics that we are talking about here, that would not be possible. I did not realise the situation in that respect.

Similarly, if we could have the incidence of these accidents and Mr HARTMANN mentioned the study in which 1/15 of all accidents were studied in order to get some idea of the incidence of any particular type of injury, that would be very helpful. Finally, if the injury could be delineated a little more completely, it would be helpful to those of us involved in biomechanics, who try to use this data.

Intervention by Mr FRANCHINI

My question is on a point of detail. I am only raising the matter because the members of the Panel come from a number of countries. I feel it would be interesting to know whether the terminology used in the various countries for the description of accidents has been standardized at national level or international level.

Intervention by Mr MAYER

For us statisticians, the standardization of terms is fundamental to our work. This is what we are discussing and it is our task.

I should like to ask Mr Petrucco to return to the question of the safety belt that he brought this morning. Mr Andreasen dismissed the problem when he said in his paper that the matter was settled as all countries had adopted it. Mr Petrucco said that it was not so simple and I should like him to clarify that point.

Intervention by Mr PETRUCCO

Although the collection and preparation of data on the wearing of safety belts does not, as far as I can see, present any great difficulties as to method, I have raised this question because it seems to me a typical example of data that can be gathered cheaply and quite easily, and which provides valuable information for a wide range of users. These are primarily the Governments, which have to issue laws and regulations, instruct the police to keep a strict or less strict watch on certain matters, grant type-approval for safety belts, etc. Other users of such information are the industrial firms which produce the belts and various bodies, including insurance companies, who are now launching very expensive preventive campaigns.

The wearing of safety belts is something new, and you in the European Communities can already make a start towards harmonization by collecting information on the subject. When I say this, I am speaking in general terms, for what I have just said does not concern safety belts alone, but other safety equipment as well, e.g. helmets. I should like to thank Mr Hartmann, representing the motor manufacturers, who this morning stressed the importance of collecting this kind of data on the use of safety devices available to motorists.

This is why I was somewhat puzzled to read the short passage in Mr Andreasen's report - to whom congratulations are due, for the report was a very good one - in which he said that data on the wearing of helmets and safety belts would dwindle in value as the use of these protective devices is now being made compulsory in more and more countries. I consider, on the contrary, that it is just because these protective devices are going to spread throughout the Common Market countries that the data ought to be collected, and a statistical enquiry has already paved the way. Another point to be borne in mind is that a legal provision is not invariably applied, and sometimes not applied at all. Mr De Regt has already drawn our attention to this point, and it is true enough : there are many people who put the safety belt round them to avoid being caught by the police, but do not fasten it. It is here, I think, that the question of costs comes in, for these data can be put to effective use right away. As insurers we are not in favour of regulations making the wearing of safety belts compulsory : we believe that people have to be convinced, and that calls for very expensive public relations campaigns. Now here statistical data could prove extremely useful to authorities and private bodies, as it would serve as a sort of thermometer by which to measure the degree of utilization, and would show how many injuries can be attributed to failure to use the safety belt.

To conclude, I should like to say that studies have been carried out in this sector - some of them statistical - by various bodies, notably the German insurance companies. I mention Germany in particular because I am rather disappointed not to see any German representative on your panel, either from the public or from the private sector. I mention Germany, too, because I know that there has been very close collaboration in that country - as indeed in others - between the Government and the insurance companies on the study of this problem at statistical level.

Intervention by <u>Mr BONGER</u>

In connection with what the previous speaker has said, you may be interested to hear what our experience has been regarding the problem of the use or non-use of safety belts. For several years we have been trying to have this question included in the traffic accident form, which as in most other countries is completed by the police. Strangely enough, however, we have so far been confronted, on the one hand, by a complete lack of appreciation of the problem, and, on the other hand, by the unwillingness of the police to fill in the form on the question as such. In one way this is understandable because the police usually arrive at the scene of an accident after the accident has occurred and this means that they would then have to ascertain whether or not the safety belt had been worn at the time of the accident. In the Netherlands, one copy of the report of the accident is sent to insurance companies and, naturally, victims of accidents are then afraid, whether justifiably or not, to admit that they had not been wearing a safety belt because of the risk of not being paid by the insurance companies.

On the other hand, whenever changes have to be made to the traffic accident form - and not just with reference to the safety belt - the question at once arises : does this mean extra work for the police ? However, even if the answer is in the affirmative, no action will be taken on it. This is because in the Netherlands there is no authority which is empowered to draw up directives at national level for a relatively autonomous police force. We are confronted with this situation, which we in the Netherlands very much regret, perhaps it is the same in other countries too. Whenever we want to bring in something new or to improve the existing statistics. I therefore hope that it will be possible to achieve through the medium of the European Communities what we have not managed to accomplish at national level.

Intervention by Mr DIELEMAN

I should like to add a word on the wearing of safety belts, because this is a standard example.

In Belgium, the Gendarmerie has included, on the new accident report form, a question on whether a seat belt or helmet was being worn. There is accordingly no problem where the form is concerned. As the Netherlands delegate explained very well, the police who arrive at the scene of the accident after the ambulance can only report what they see and must therefore rely on statments by witnesses, if there are any. I will tell you right away that in Belgium a solution has been found to the problem, since the wearing of a seat belt is obligatory and this obligation is very well complied with, by which I mean that everybody puts it on, but puts it on badly.

You must not think that mass statistics will provide information on how the belt was worn. Since everybody wears it, all that needs to be done is to check the trend in the number of victims per category of users in order to see whether there has been any effect. And this is a standard example where mass statistics can enlighten us. We currently possess accident figures for the five months following the indroduction of the obligation. These results show us that the number of victims decreased by 24 % in the case of car occupants, whereas in the other categories, i.e. among pedestrians and riders of two-wheeled vehicles, who represent almost half of the victims, the decrease was only 2 %. Here, then, is a break in the trend, which confirms for us the influence of the belt, because the belt is the only new element. This example shows what can be achieved with mass statistics, but it also shows what their limitations are : it is certain that you cannot, on the basis of mass statistics, establish for exemple, that Volvo's belt N° 1 is better than Fiat's belt N° 2.

Intervention by Mr HOPPENBROUWERS

Thank you, Mr President.

I get the impression that we are faced with tremendous difficulty to provide statistics which are not easily obtainable and cannot be introduced from one day to the other. I would like to propose that at least we agree on two things. First of all, that we recognise the need of this kind of statistics to allow the design of better performing cars and of cars that are maintained more easily, and secondly that we - if we cannot do it all at once - advance step by step. I have also heard that it is no great problem to determine whether the seat belt was used or not. We could work step by step, we could evaluate in many accidents what the influence was of the type of wind-screen : was it a laminated one or a toughened one, did it or did it not contribute to the severity of injuries. Because we are on the threshold, the evening before the law making on wind-screens, we can go step by step, but if we do not start today, we will not have any means to do it better in five years or ten years from now.

Intervention by Mr HARTMANN

It is obvious at this meeting that the level of information on work being carried out here and there by manufacturers or national bodies varies and perhaps thus does not make the discussion any easier.

If the public authorities need to examine the safety situation in their country, this examintation will take the form of questions which those responsible ask themselves. As soon as they ask these questions, they know the degree of accuracy they need to obtain a clear picture of the road safety situation. Thus they have at the same time defined the information they need on the situation and the degree of accuracy they require to analyse certain phenomena. This shows the level of spacialization of those who will have to examine the situation; they initiate analyses in depth that are necessarily carried out on a small scale using sampling techniques well-known to some of you (in France in any case) which make use of the possibilities offered by national statistics; the conclusions can then be extended to a wider context. All the questions which have so far been asked concerning the safety belt, the windscreen and technical inspection are questions that can be usefully examined only by specialists on small well-selected samples. When I arrived in Brussels I heard that at a meeting of the symposium yesterday or the day before some countries said that 27 % of accidents were caused by technical defects in vehicles. This seems to me to show that there are still badly conducted surveys : it is meaningless. The national road safety body in France (ONSER) recently carried out a study known as "Vehi-test" designed to determine whether technical inspection of vehicles was an economic proposition or not. They tackled the problem by training experts to investigate accidents and classify them in four categories : first to define what was meant by vehicle defect (here I am sorry to say that the definitions given in Mr Andreasen's paper are not at all clear "deficiency or no deficiency").

These four categories are :

1. a technical defect played a part in the occurrence of the accident;

2. a technical defect perhaps played a part in the occurrence of the accident;

3. a technical defect aggravated the accident which would have occurred in any case;

4. a technical defect perhaps aggravated the accident but was not directly involved in causing it.

On this basis, the study carried out on a small sample, extended to a wider context by making use of the facilities offered by national statistics, enables those respnsible to draw conclusions. That is the approach adopted. It appears to me that we could adopt the same approach to move from national to international level but I think it necessary to repeat the basic examination, i.e. to improve road safety today, what degree of clarity is required in examining the situation ? How much money can be spent on it ? What experts are available ? What experts can be trained ? What statistical knowledge do we have ? etc. We ask the appropriate questions and then we offer the other countries the best statistics hoping that they can make use of them themselves. This is how manufacturers in general view the situation. Nevetheless I would point out that as regards the study of safety belts manufacturers did not wait for international statistics to tell them whether the belt was effective or not : Volvo carried out an excellent study a long time ago and the Europeans have also investigated the effectiveness of the belt. This is a matter for experts. Mr Lefranc of the road safety delegation has information on the effectiveness of the safety belt in France (condition of occupants wearing and not wearing belts) and is well aware that there is much uncertainty in the opinion of the police, when they examine the car, as to whether the occupants were wearing their belts or not; sometimes they have to take the evidence of witnesses into consideration. But the uncertainty is known and if we are to make further progress we have to do what the manufacturers are doing, what ONSER is doing for its part : train experts, obtain the cooperation of doctors and statisticians, for teams, analyse accidents case by case and assess belt performance while endeavouring to determine the conditions under which it was worn, the factors which limited its effectiveness, etc. The same applies to windscreens; Doctor Mackey of Birmingham has carried out a comparative study on the effectiveness of laminated windscreens and toughened windscreens with a team from California having the same vehicles but equipped with different windscreens. Using extremely stringent statistical techniques, they have reached final conclusions.

On the basis of this method, adjusted as necessary at national level, I believe that the problem should be reviewed on these lines so as to determine what each country can provide at international level that will be genuinely useful to each of the others.

Studies decided at international level and carried out by experts on extremely precise subjects will contribute very much more and give much more reliable results than can be obtained from statistics imposed from above without a sufficiently clearly defined aim.

Intervention by Mr ROSSI

From the discussion and speeches that we have heard here, it seems to me that practically everybody is having a go at that Aunt Sally the Road Accident. The police are interested for reasons of law and order; the doctors are interested, and rightly so, with a view to improving the conditions of life; the insurers are interested because of the huge problems it creates, including financial problems; and the road users are interested too, as we heard a short while ago. Now I am going to say someting about it as a civil servant in the Italian Ministry of Transport, a public administration which drafts and lays down rules and regulations relating to drivers, vehicles, traffic, road signals, etc., with a view to achieving a better flow of traffic and a higher level of road safety.

I must point out in the first place that abnormalities constantly occur in road traffic; sometimes they lead to accidents and sometimes they do not. Then again, not all the accidents are recorded, and, if they are, they may be recorded only by the insurance companies and not by the police, with the result that they never become statistical material. I find that nearly all the consequences of the road accidents that are reported are of a fortuitous nature. In the course of my work, for instance, I have to examine many accidents in which a pedestrian is struck from the rear or from the right, and I have noticed that a few centimetres one way or the other in the direction of impact can make all the difference between the pedestrian being killed or having his clothes torn. Hence the authorities who lay down the rules will certainly be interested in traffic abnormalities as a whole, including the near-accident. I can therefore talk about potential accidents instead of restricting myself to actual accidents that may or may not result from these abnormalities.

Above all, however, it seems to me that we have to be quite certain that the study of only those accidents that are reported, and of their consequences in terms of damage to vehicles, fatality or injury, is really significant for the purposes of the authorities. As some of the previous speakers have already pointed out, we need to know the effects of the regulations we lay down, and we must therefore be sure that a given type of study will provide a satisfactory measure of those effects. The Belgian representative has just reported a noteworthy example in connection with the wearing of the safety belt. Just a word on this from our point of view. The study of the accident will have to provide a feedback for a safety policy. I have to admit, however, that at present we have no other means available for this purpose than the existing road accident statistics. These statistics tend to vary from one country to another, and it seems to me that they all suffer from the fact that they are prepared on the basis of statistics supplied by the police, who collect them for their own ends and for the purposes of the courts. Hence those we can make use of are by way of being a by-product of this information. In this connection, I might mention that studies are in progress in Italy to improve the form of the accident report, which is always made out by the police authorities. I am sure that the information I have received at this seminar will be of great assistance to us in modelling this report on the genaral lines that are agreed here.

It seems to me, however, that in order to achieve anything useful we shall have a good deal of approximation to do. The ideal solution would no doubt be for each country to keep standard "European" statistics - a collection of data that would satisfy the needs of the authorities, the needs of the insurance companies, and the needs already referred to by a distinguished speaker with respect to definitions of damage reported by the persons concerned.

Before this happy state of affairs can be attained, however, I feel that there are several lines along which ce can work. Firstly, we must extract from the existing statistics all those that are identical or easy to compare, and use them to built up European statistics. Secondly, we can establish criteria for sampling the population - the accidents that occur in each country - and examine the sample independently of the national procedure, e.g. on the basis of the form shown in Table 2 of this excellent report, with perhaps a few additions relating to the road situation. Thirdly, as somebody has already pointed out, the criteria used in arriving at this sample may be either problem of accidents of particular aspects in which the Community is more interested. Lastly, perhaps I need hardly say that these statistics will have to be collated with the other Community statistics in order that more general conclusions can be drawn from them, and above all that it will have to be made clear who can make use of them and for what purpose.

Intervention by Mr DIELEMAN

I should like once again to stress the aim of statistics. You have said that they serve for the preparation of the decision and I agree with you. But I believe that we also need statistics after the adoption of measures in order that we may assess the effect of such measures and correct it if necessary, and above all in order to use these statistics for road-safety propaganda. It is not sufficient only to tell road users that they have to wear seat belts; in order to convince them, it is necessary to prove that this measure has really been effective.

It is consequently necessary to distinguish between the requirements of research and those of government, and there you have the entire difference between mass statistics and the specific statistics desired, for example, by the vehicle manufacturers. It is certain that mass statistics can reveal the percentage of side-impact accidents, the percentage of accidents in fog, etc. These data are necessary in order to avoid arriving at decisions by guesswork, after which it is realized that, after all, very little effectiveness can be expected from a measure which affects only a minority of accidents. Furthermore - and here I am entirely of Miss Sabey's opinion - I believe that, as regards specific statistics, the research workers who know the problem and who wish to study it must agree among themselves in order that their samples and their working method may be valid. They must then announce their conclusions as soon as they reach them. In this connection, Miss Sabey spoke of an international documentation system, which is not the same thing as internationalizing the data banks.

Let me reiterate that mass statistics means statistics recorded primarily by the police, with all their limitations, and therefore concerning, above all, the user phenomenon and also the scene of the accident.

There is one practical suggestion that I should like to make : at this meeting it can be seen that there are three groups of participants : those who deal with statistics and who, for the most part, are members of national statistical institutes which are basically compilers of statistical tables; secondly, those who deal with road safety; thirdly - and I believe that we are very few - those who deal with road-safety statistics.

I should like to request that, when you are talking of road-safety statistics, you should not fail to elicite the people who deal with them and who are very rarely found in national statistical institutes.

Secondly, I regularly receive for completion a large number of questionnaires from the ECMT, the OECD, to mention but a few. They always deal with the same problems but are in no way coodinated. For example, one questionnaire asks how many children from five to nine years of age were killed, while in another the age group specified is from five to ten years. I have already shown that none of these classifications is at all meaningful, but searching out the figures involves a lot of work.

I should also like every statistical publication to mention the definitions used, together with the date to which these data relate; often the date of the population census does not coincide with the period covered by the accident statistics. A mention of the exact definition of the data published should make it possible to avoid substantial fluctuations in such stable data as stable as, say, the area of the national territory.

Let us now speak about the trend. To avoid false interpretations, it would be advisable for countries to point out the factors which, in their opinion, were responsible for the changes. These comments could possibly be limited to a statement of the measures that were taken and of the dates on which these measures came into force and were discontinued. What conclusions can you draw, for example, from statistics relating to the year 1973 or 1974 if you do not know that the energy crisis and the measures connected with it began in Belgium on 10 November, whereas in another country they began on 1 October ?

Likewise, if you compare the accident trend in 1974 and 1975, you will conclude that the situation improved considerably in Belgium : in 1975 there were fewer accidents and fewer victims; but the reality is that there were two systems of restrictions in 1975 : one from January to May, a speed limit of 90 km per hour. Whan you compare this with the first five months of 1974, when obviously the speed limit was that prevailing during the energy crisis, you ascertain that there was a completely normal increase in accidents. But on 1 June, with the same speed limit, the wearing of seat belts was made obligatory. This measure is going to result in a reduction in the number of victims.

What are you going to conclude from that ? The correct answer is that we have had two systems of restriction, a "speed limit for five months", which was not so effective, and a "seat belt system", which was very effective. This example shows that, at the international level, it is very difficult to keep all this in view. So, what should be done ? I believe that Miss Sabey's proposal should be adopted : the national experts should draw up reports on, for example, the effects of speed limits or the wearing of seat belts. It is also necessary that these reports be well done and not unduly influenced by politics.

The rapporteur spoke of types of accident, and this is very important. I should like to add that the victims should be classified according to all the vehicles involved in the accident. The conventional breakdown of victims according to vehicle category shows that only 4 % of the victims occur in the commercial vehicle category. However, when I take a look at the victims in the other categories, I find that commercial vehicles were very often involved. If you do not possess a breakdown of victimes according to the category concerned, you lose a lot of very valuable information in this way.

There is a final point to which I should like to draw your attention : although it is true that the seat belt does not reduce the total number of accidents, it fortunately does reduce the number of accidents involving bodily injury. But since, as a rule, only the latter are recorded, it is normal for the obligatory wearing of seat belts to result in decreased figures for the number of accidents involving bodily injury.

COMMENTS BY THE CHAIRMAN MR MAYER

I shall in my turn propose some general ideas and give my opinion on some of the points that have been raised.

First a few general ideas. I find it quite remarkable that in an assembly as varied as this with a wide range of users represented a fairly general consensus has nevertheless emerged. This morning I was afraid that we would be forced with a large number of conflicting demands. That has not happened : the discussion has remained at a general level and for this I should like to thank you.

The first general idea, well outlined by Mr Dieleman : it is necessary to distinguish basic (or general) statistics from specific statistics. Obviously our role in the Statistical Office is primarily to produce basic statistics while the preparation of specific statistics should be left to groups whose aims are known or complementary. These groups should of course obtain the assistance of statisticians and it also seems desirable for these specific studies to be extended to the international level.

A second idea that occurs to me is that in the area of road accident statistics the international or Community statistics (and here I am speaking of basic statistics) are no more than a collection of national statistics, possibly in consolidated form. We carry out no Community surveys to obtain basic information on road-accident statistics but merely gather together national statistics so that from this point of view the seminar has approved the pyramidical organization of statistics as proposed by Mr Andreasen.

A third general idea that has emerged from this seminar is that it is difficult to coordinate the various sources at international level. Dual coordination, international and inter-source, is extremely difficult. For example, we could try to harmonize police statistics and regard them as the basis of our international information; we could also propose standardization of medical statistics - the international medical nomenclature is one of the oldest in existence in the world; we could also standardize statistics at manufacturer or insurance level, but it is not realistic to believe that we can coordinate all these things internationally as we can nationally, a point that is well presented in Mr Andreasen's paper. In my opinion, this finding will oblige us at Community level to base definitions on a single specific statistical source and police statistics, despite all their failings described by many speakers, nevertheless appear the most suitable to provide the most important information.

Another idea that has been expressed and that appears to me to be of general significance is the cost of change. I said this morning that there were forms of harmonization that cost nothing; it was pointed out to me that nothing was ever free. This is true : any change is bound to cost something. That does not mean that changes must not be made. The whole history of statistical harmonization is nothing but a series of changes of varying scope made in individual countries. To take an example : to change a nomenclature of activities is infinitely more costly than to change the definition of death, and yet France has just changed hers. Such changes will be increasingly costly in the future since, as Mr Ledru has pointed out, computerization of data makes change much more difficult. Computerization offers flexibility in the use of a file but makes it very difficult to change the file. That is why we must think of harmonization now because if every country starts to computerize its system and to make up complete files of accident statistics that are bound to differ, international coordination will become very difficult. My conclusion, therefore, is not that changes must not be made - they can always be made, even if they are expensive - but that we must change as quickly as possible so as to benefit from the changes that are being made in national statistics to introduce greater coordination.

A final idea was suggested to me by several participants and in particular by the last statment by Mr Hartmann : at the same time as promoting good statistics, and well-standardized statistics, the difficulty of which has been constantly underlined today, we must also fight against poor statistics. As you all know, while we are constantly saying to each other "we must not produce such-and-such a type of statistic because it is too precise, because it is not good", we see every day in the press statistics that we know are not comparable.

These general ideas lead to a number of conclusions regarding future action.

The first is that we, the Statistical Office of the European Communities, must give consideration to this obviously very important problem. I believe that we should revive the working party to meet regularly as a more or less standing body; its members should be national statisticians specializing in road accident statistics.

Mr Dieleman has pointed out that its composition must be carefully chosen. It is not at all certain that the ideal solution would be to draw its members solely from the national statistics institutes. There are in this field, as in many others, statistical experts and organizations outside the national institutes. The situation differs very much from one country to another : there are countries where the national statistics institute has a very strong coordinating role and others where this is not the case so that national circumstances must be taken into account when selecting the members of the working party. However, I am convinced of the usefulness of a working party of this type in promoting good statistics and combatting bad ones.

I believe that this working party should be assigned a number of aims and that medium-term aims should be distinguished from short-term projects. It would be a good idea for the working party to prepare standards going beyond what can be done immediately, not in order to make them compulsory or to propose questionnaires based on them, but to ensure that countries setting up new systems do so on the lines of what has already been jointly decided. I do not think that we can propose very detailed standards at Community level; however, we can propose standards with classifications, nomenclatures, in fairly broad groups and I believe that Mr Andreasen's Annex II should be discussed on these lines after this seminar. Mr Andreasen proposes a number of major classifications such as classification by accident type, vehicle type, etc. in broad groups.

These proposals should be discussed and could be adopted as an aim for national classifications which could themselves be more detailed. This is all the more useful in that national statistics evolve and in any case changes are made to them regularly. In addition to preparing these standards as medium-term aims, the working party should also in my opinion propose short-term projects.

Consideration could first be given to fields in which a start has been made on internationl standardization; here I am thinking in particular of the Economic Commission for Europe to whose work many of you have referred. One of the tasks of the working party could be to endeavour to persuade the nine Member States to adopt a common terminology and common definition on a small volume of information.

The first thing that comes to mind is the definition of fatalities and injured. Let me say in passing that for my part I gather from all that has been said here that the only important figure on fatalities is the number of people killed outright. This is a simple, clear figure which can be recorded without difficulty by the police and which is probably the most useful for motor manufacturers as the difference between a victim who dies within 30 days and a victim who is killed outright depends on many factors other than the vehicle. However, I do not wish to raise this point now; it will be up to the working party to decide. As Mr Baggendorff said, if attempts have been made for 20 years to have the definition of fatality according to the 30-day rule adopted, it is probably because that is felt to be the best definition. I also believe that these definitions of fatality and injured have such an impact on public opinion that we should think very carefully before abandoning a common definition.

Another type of information that could easily be standardized at Community level is the classification of vehicles. The results would then have to be used correctly and here I believe that Mr Dieleman is right.

A third point on which the working party could try to obtain action in the short term is the description of accidents. Geneva has already proposed a breakdown into four groups and Mr Andreasen proposes ten groups. This type of thing could usefully be discussed by the working party and it could try to have its results adopted. My own idea is that the working party could discuss these matters and as soon as it reached conclusions, they could be put before the Council for agreement in order to make them compulsory in the Member States. Those are my ideas on these three points but of course the working party would have the final say.

As regards the specific analyses, we can indeed play some role, although it is more difficult to define just because these analyses are specific. I do not think that we are best placed to encourage work of this kind : the initiative should really come from research centres, road safety organizations, motor manufacturers and other organizations of that type. However, the Commission could organize the dissemination of the results of the work. It already has a Directorate-General dealing with the dissemination of information of a scientific nature which has developed arrangements for the collection and distribution of documentation at Community level. Consideration should be given to Miss Sabey's idea of applying these documentation distribution techniques to the results of work on traffic accidents; in my opinion it could be put into practice.

A final point : Mr Dieleman rightly pointed out that international bodies must coordinate. The Statistical Office is currently making a major effort in that direction : it participates regularly in the work of the United Nations and OECD and if the working party I referred to is set up, I think that we could obtain harmonization of questionnaires at international level. Let us not forget that the Community carries great weight in the Economic Commission for Europe and in the OECD and once a Community working party has taken a clear and good decision we generally manage to have it adopted in a wider international form.

These are the conclusions that I wish to put to you and I would like to have your opinion on them. I would appeal in particular to the members of the panel and to the rapporteur to supplement these comments and to draw their own conclusions from our work.

Commentary by Mrs HILL

I think the discussion this afternoon particularly has brought out even more clearly to me as a user of the statistics, the difficulties inherent in compiling detailed statistics, even on a national basis.

I would therefore suggest that any international statistics which are to be harmonised can only start in a fairly modest way. This I think is the point that Mr Dieleman was making and which you yourself referred to chairman, when discussing the work of a possible working party. In that sense I welcome particularly your proposals for short term action, and which suspend judgement to an extent on the longer term possibilities. I do agree that there is a great scope for a greater amount of exchange of information on the detailed subjects on an ad hoc basis.

Perhaps I can illustrate the distinction I see here by reference to one particular area. Discussion this afternoon has perhaps understandably concentrated on the effect of vehicle factors in the accident situation. From my own point of view this is an interesting area, but not the main one in which my organisation is concerned. We are rather more interested in the influence of the road environment, which has been little mentioned today. This is an area where there is very little information available, even on the national level, and which is even more difficult to collect, I think, than perhaps information on vehicle faults, bearing in mind that the prime source of accident statistics is a policeman.

Nevertheless, this information is of interest for policy decision, but it is only of interest to certain areas of users of statistics. I would therefore take this as an example of an area, which would not be appropriate for first stage inclusion in this basic set of mass data compiled on an international level, but the sort of subject where further and closer international cooperation on specific studies would be appropriate. The only point which I think could be included in base data in this particular area would be figures showing the class of road or rather the standard of road in terms of number of lanes etc. on which the accident occurred. This would enable at least a preliminary estimate to be made of the accident rates on different standards of road.

Commentary by Miss SABEY

First of all, I would like to say that I support the conclusions that have been outlined in general, and particularly I welcome the idea of the simplification of the mass data collection, and especially also the ability to have dissemination of knowledge on the more detailed studies throughout the Community.

Perhaps I could add just one thing for the benefit of the vehicle constructors, who I feel may be perhaps a little dissatisfied with the conclusions, which may not perhaps cover their particular needs for more detailed investigations related to vehicle features, and I would like to suggest that the reporter of this group could perhaps mention or make reference to the work of the OECD ad hoc group, which I think in its deliberations in the future will be helping to fulfil these needs. I was talking to the chairman of this group yesterday, and I believe that in the discussions which will take place between the different countries, we shall be talking about how we can coordinate more investigations which will take into account the features which have been mentioned by various people amongst the constructors. So I would like to see perhaps some reference to that group and its work made in the conclusions.

Just one other point to take up : Mrs Hill's point about the road environment. I would support her views and perhaps I can again mention some of the OECD work, which has specifically looked certainly from the research point of view, at some of the problems of the road environment, and one of its groups will be reporting next year, specifically on hazardous road locations and road environment features, which affect hazards on the road.

Commentary by Mr ANDREASEN

I agree with Miss Sabey that it would be very useful if a documentation clearing house could be set up throughout the European Communities. Especially for the smaller countries, which I spoke of earlier and some of which in any case have not been properly involved in some of this detailed work, as Miss Sabey mentioned in connection with the field of competence of the OECD, it would be useful if it were possible in this way to gain a better insight into what was taking place in the other countries.

Having said this, I should like to refer to the proposal put forward by the Chairman concerning the setting up of a working party. My attention was drawn in particular to the proposal on the new long-term arrangement of priorities for standards of various kinds. This comes close to something I find very important, namely a form of guidance for national systems in the event of reorganization. Clearly, it is very expensive to reorganize systems, but it is done even so, as we have heard several times, and as we who live with it from day to day know, changes are made every ten years or perhaps even more frequently. In this context it would be useful to have some international standards towards which we could work and which perhaps in the event of a reorganization of that kind, could be introduced as well as any other standard. In this way it would of course, be possible to secure a number of advantages if everyone introduced the same standards after a certain period.

I think there is perhaps one thing that could be added in that connection, namely that it would not necessarily have to be limited to standards for various factors with which the working party was able to deal. It might indeed also be envisaged that the working party should sketch out some form of method which would perhaps enable more extensive use to be made of information in miscellaneous records. I am thinking here of some of the things that Mrs Hill mentioned earlier, namely road information. There are in Denmark, as presumably in a number of other countires, a great many road registers which give this information and from which, if a collection system based on a particular method is set up, in which the reporting officer - i.e. the policeman - on the spot describes the scene of the accident, it will subsequently be possible by the use of such registers to extract much of this technical information, which the policeman is, of course, unable to give on the spot. There is another form of record utilization which could be considered in this connection. It is the question of engine or vehicle registers, and one of the speakers from the motor vehicle manufacturers indeed mentioned that they were interested in obtaining precise information on the ages of vehicles, what models were involved, whether any structural modifications had been made during their lives, etc., and those are things that could in any case be obtained from the Danish vehicle register and presumably many of the vehicle resgisters in existence in other countries also contain these data. This is certainly something that should be borne in mind when a system is changed. Consideration should perhaps be given to the adoption of some standard method which enables more extensive use to be made of these records. I shall therefore recommend that the working party's terms of reference be extended to include some form of standardization of methods for the collection of accidant data.

Commentary by Mr HARTMANN

As you know, as part of the studies under the programme of the Committee on the Challeng of Modern Society (CCMS), the experimental safety vehicle (ESV) programme had been assigned to the United States. Europe and in particular the manufacturers have followed up the execution of this programme. The implementation of this programme was extremely expensive for all concerned and at one time it was necessary to start again on a new basis because it was realized in time (but too late for all the money that had been spent) that, despite the existence of accident statistics, information on road accidents required for the programme was totally inadequate. Because of the economic and energy difficulties experienced by all countries today, we cannot afford the luxury of starting experiments of this kind again. Consequently I believe it is absolutely essential to see that as much as possible is done at international level - and particularly in Europe - to ensure that any research results suitable for dissemination and of interest to all those responsible for drawing up research programmes or for decision making are brought to the knowledge of all concerned in suitable forms.

Commentary by Mr de REGT

In the main, I agree with the formulation of the report as presented by you. I am pleased that you have made a distinction between basic statistics and specific statistics and that you concentrate chiefly on the basic statistics. I was also pleased to note that in the short term you hope to make the national basic data comparable. I hope that you succeed in your efforts because I wish once again to emphasize that what concerns us in the final analysis is the use of these statistics.

Consequently, the membership of the Working Party which will supervise the work on behalf of the Community will have to be chosen carefully. It has already been said that today little mention has been made of the technical aspects of roads in connection with traffic safety. This morning I pointed to the influence of town planning on traffic safety, a fact which was recently recognized and acknowledged in the Netherlands by the Government. These aspects must not be forgotten when it comes to appointing the members to the Working Party.

Another aspect that we must not lose sight of is that the basic statistics we want to compile must serve to guide political decision - making in connection with traffic safety. The selection of data and the groupings will have to be carried out in such a way that it will be of use. In this connection, the splitting-up of data into specific fields of interest is a most important task which the Working Party will have to undertake. Here is a tremendous need for politicians to be able to compare unsafe situations at the international level, not only by country but also by specific field of interest.

A last point I should like to make is that statistics must be readily available if they are to be used by politicians. This too is an aspect which I feel should not be forgotten.

Comments by Mr GAFFARD

Mr Chairman, I believe that the conclusions you have proposed to the meeting correspond very precisely to what was said. They seem to me to be particularly clear and I subsribe to them entirely.

I should simply like to make a brief remark regarding the Working Party that you have proposed. Although, for reasons of efficiency and economy, such a Working Party should not be too large, I would suggest that we do not forget, at least during the discussions on accidents involving bodily injury, to obtain the opinions of a certain section of the medical profession so as to benefit from this experience in those matters. I am thinking of two groups here. On the one hand, there are the surgeons specializing in traumatology, particularly those of them who have done research in the field that interests us. It was commented just now that there was no representative of the Federal Republic of Germany among us. This is why I should like to point out that in the Federal Republic, especially at Heidelberg, extremely useful work has been done in this field. The other group that I believe would be very useful in the study of traumatisms is the group of epidemiologists, which is not entirely comparable with group of statisticians.

Comments by <u>Mr THIRY</u>

I was very pleased to hear that a great deal of importance was being attached to definitions. I do not think that any statistic can be perfect and, whatever one does, one will never achieve perfection. However, we statisticians are always saved by knowing exactly what information is being covered by the figures in the tables. Thus, whan I study tables of figures to compare them with my own statistics, I need very precise definitions because the figures never correspond and without the definitions I cannot make the necessary adjustments. This symposium has gathered representatives from a number of fields of activity. There are motor manufacturers, representatives from road safety organisations and from the police. They all have their own statistics in their own fields. They produce statistics for their own purposes and in accordance with their own special interests. Neverthless, statistics produced for different purposes can be compared if suitable precautions have been taken to define the information contained in the figures.

Another point that I noticed in your conclusions, Mr Chairman, concerns the situation in the medium term. I also believe that it is essential to make provision for far more than our immediate requirements in the information we plan to seek today, which means in the questionnaires which are going to be drawn up. Even if all the information is not used immediately, as is certainly the case, a section of the data can be used at any given time and another section at a later date. Then, if some of the data proves to be unusable it can be scrapped. However, it is always very difficult to introduce new information at a later stage. I think, therefore, that it is worth making the questionnaire as broad as possible from the start, having due regard to national potential.

Intervention by Mr LA COUR

One brief remark : I can subscribe to the idea of a working party, but I would ask that the first task assigned to such a working party should be to try and determine in somewhat more detail what the actual needs are in respect of accident statistics; I believe that it is important to distinguish between the various needs, i.e. as seen from the standpoints of road construction propaganda, legislation and vehicle design, and I think that it would be useful to attempt to divide up these needs and perhaps ascertain how the various types of requirement can be met.

I feel that the exchange of views which has taken place here has been useful, but we should not hide the fact that the discussion has been somewhat diffuse, because some want this and some want that, and consequently the situation is often such that we cannot get down to dealing with a subject properly in concrete terms. I believe, therefore, that it would be useful to do a little mapping out of at least the most primary needs and, with this as the starting point, to try to establish definitions and, possibly, to undertake a standardization of the statistics.

Intervention by Mr DIELEMAN

I should like to clear up a misunderstanding which is due to my expressing myself badly. When I said that the number of fatalities was relatively less important in my eyes, the reason was firstly that, like all users who are at all acquainted with the subject, I possess the correction factors that enable me to compare the fatality levels in the various countries, whatever the definition used. Secondly, organizations such as that which I represent are particularly interested in the consequences arising from the different measures adopted in the various countries, hence it is primarily the trend in the number of victims that interests me.

Having said this, I would not like it to be assumed that I am not interested in absolute figures : on the contrary, I think they are extremely important.

Intervention by Mr LEDRU

I should just like to add something concerning the exchange of information on specific studies. I gather from what has been said that this exchange would relate chiefly to the results of studies carried out at national level. For my part, I think that in the case of specific studies, the results are indeed important, but in my opinion it is still more important to know haw they were obtained. Here we touch upon a problem of method,

and, in reality, I think that the task to which priority should be given is, if not to harmonize the methods or give them a Community "seal of guarantee" - which would be rather utopian - then at least to learn exactly how studies were performed. From time to time there appear on the desks of a number of journalists results which are seen to be entirely contrary to the known facts, and it is not known where these results came from.
I therefore think that one of the important and really worthwhile tasks is not so much the dissemination of study results, but first and foremost the achievement of a measure of standardization with regard to methods.

Intervention by Mr MAYER

I do not think we should be too ambitious, despite everything. When we speak of the dissemination of specific studies, we do not mean dissemination of the results alone, but of full information on the study, including the methods used to obtain the results. However, I do not think, at least as an initial aim, that it is conceivable for a Community working party to award a kind of quality label. But perhaps that is not what you meant.

Intervention by Mr LEDRU

My proposal was not that a quality label should be given to individual studies but rather to types of studies, such as before, after, or a study of a reference sample : there are a number of precautions to be taken which almost all statisticians or design engineers know and apply. However, some people not fully qualified in traffic questions sometimes forget some of them. I think that we should just establish a sort of check list of precautions to be taken for various types of studies. If the precautions are not taken, the study should not be distributed. I think it is as clear as that. I do not know what the members of the panel think.

Intervention by Mr MAYER

Your idea is somewhat similar to that expressed by Mr Dieleman just now. In other words, it is not enough to have statistical studies, they must also be good. That is fairly general.

Intervention by Mr HARTMANN

We have much to gain from the publication of statistical digests summarizing the main results of studies carried out in Community countries and supplementing the usual tables. It is extremely important to ensure that full details were given on the definitions of the categories adopted, the methods of obtaining the data and the possibility of generalizing the results obtained. This is probably a little less ambitious and a little less radical than the solution recommended by Mr Ledru, but I think it leaves more latitude, and offers greater possibilities of dissemination than the rather strict rules and rather stringent sanctions that could be imposed by a Committee of Experts on the quality of the work proposed.

Final statement by <u>Mr MAYER</u>

We have now come to the end of this seminar.

The discussion has in many ways enriched my attempts to derive conclusions. All this will now be examined by Mr Andreasen, our rapporteur, who will draft a summary of conclusions that will be used tomorrow at the closing session and the press conference organized for the symposium as a whole, at which we have to report on the conclusions of our seminar. These conclusions will not of course commit you as this seminar was not an official working party of government experts, but it provided an opportunity for an exchange of views from which we have derived extremely interesting conclusions and ideas.

It merely remains for me to thank you all very much, not as I did this morning for having coming here, but for your contribution to this very lively and extremely interesting seminar.

I am sure we have learned a lot and I hope that we shall be able to make use of all that we have learned today. Many thanks to our interpreters who enabled us to follow the discussions with absolute clarity. It only remains for me to wish you a good journey home.

The meeting was closed.

CONCLUSION OF THE SEMINAR
by Mr E. ANDREASEN

The Commission organized this seminar as part of the European Symposium on Trends in the Regulations concerning Motor-Vehicle Design with the objective of establishing a dialogue between the principal groups of users of statistics on road traffic accidents.

Although the Symposium was orientated towards vehicle-related problems, the Seminar was intended to deal with the problem of road accidents in general.

The Seminar made a distinction between statistics providing basic information on the one hand and detailed investigations into specific problems on the other, and took the view that the primary task of the Statistical Office of the European Communities was that of providing co-ordinated basic information.

It stated that the aim was not to develop and impose a uniform Community-wide statistical system, but rather to co-ordinate national statistics, in order to achieve higher comparability in the results. Although statistical systems based on police reports are not suitable for all purposes, they are the basis of national statistics and should therefore also be the basis of the Community statistical system.

Conclusions of the Seminar

1. The Statistical Office of the European Communities should pursue its work in this area and to this end should reconvene the working group on Road Traffic Accident Statistics. The composition of this working group would need to be studied in the light of users' interests, and it would, when formed, have to distinguish between short-term and medium-term goals.

2. For the short-term the working group should concentrate on variables which have already been worked on by the ECE in Geneva, namely the definition of kinds of victims, the classification of vehicles and the typology of accidents. It should draw up a series of precise definitions to be used within the Communities.

3. For the medium-term the working group should try to formulate further statistical standards which might exceed member States' present possibilities but could be used as guidelines when changes were envisaged in national statistics. These standards could cover not only the factors required to describe the accident but also the methods to be used for the collection and processing of data on road traffic accidents. Changes to any statistical system are expensive, but since it is in fact necessary to make such changes from time to time, such guidelines should be laid down as soon as possible.

4. The Statistical Office should also try to improve the comparability at international level between data relating to similar regions, such as mountainous regions, in different countries.

5. As to the detailed investigations into certain specific problems, it was agreed that the initiative should remain with the groups responsible for research in specific areas, who already cooperate internationally, for example within the Organization for Economic Cooperation and Development (OECD). It is possible that the Commission could, as in other fields, help here too in the dissemination of the results of such research, in order to make economies or optimum use of resources by the pooling of experience.

FINAL SESSION

For reasons connected with the presentation of this volume, the conclusions relating to each subject covered were inserted at the end of each session, although they had been presented by the seven rapporteurs during the final session.

The debates following this presentation are found together after.

INTERVENTIONS and ANSWERS

Intervention of Mr. LEMAIGRE

I should like to comment on a few points from Mr. Montabone's speach, particularly where he says that "there will still be enough petrol in the year 2000" and I would like to emphasize the priority that I believe should be given to transport and, by extension, to the chemical industry, so that it can supply hydrocarbons for transport purposes.

I shall quote a few figures which concern France in particular. Fuel consumption in France has been of the order of 150 million metric tons of which 20% has been used for transport.

What will the situation be in 1985, according to current forecasts ?

There are theories emanating both from governments and in opposition to these, from what is known as the Club of Grenoble. However, whatever estimates they may make with respect to the development of electricity from nuclear sources, which in any case is somewhat uncertain, the supporters of all these theories are agreed that in 1985, France will consume something of the order of 300 million tons which at least 100 million metric tons will have to be made up of hydrocarbons.

It is known that certain refinement techniques can produce 600 kg of light-fraction petrol and gas oil from one ton of crude oil. Therefore, the 90 million tons in 1985 will easily be enough to meet requirements. This question affects other countries in the same way, with the possible exception of the USA where a larger proportion of oil is used for transport.

As far as resources are concerned, Mr. Montabone's figures published two years ago, show that, without taking into account the question of shales and tar sands, between 1 000 and 1 500 million tons of petrol will be readily available up to the year 2000. This is all the more important if one bears in mind the extreme lack of precise information on oil resources.

Let us now consider the need for and the priority that must be given to saving and examine the effect that this could have. First : a shift over a long period in the percentage produced by refineries which represents a change-over from the European pattern to the American pattern. Secondly, further studies will have to be carried out on lead and nitrogen oxides. Lead has been mentioned from the medical point of view, that is, the immediate point of view, but it must be realized that world lead production is of the order of 3 million tons and that it is one of the metals for which extraction techniques are most advanced.

As far as nitrogen oxides are concerned, a solution must be found because measures taken against nitrogen oxides also have an adverse effect on the economy. Therefore, with both lead and nitrogen oxides we have to choose between the economy and the reduction of emissions of these two substances.

My predictions of resources for the year 2000 are based mainly on petrol and coal. Why coal ? Because it is the basis of a synthetic fuel. What then is the ideal fuel ? I am not trying to be funny when I say that if one day a synthetic liquid is invented that has more or less the same density as petrol, produces the same amount of energy, has a sufficiently high octane number, is volatile, not too explosive and is of the right density, an ideal liquid will have been found, ideal because the simplest way to store and transport energy is in a liquid. And I believe that this liquid is petrol, that is, synthetic petrol. I am sure you know that question has recently been examined in South Africa and that, at present, a South African State company is already producing 2 million tons of synthetic petrol and that a programme to produce an extra 10 million tons has been launched in that country in order to achieve energy independence through coal. I shall finish by saying that I believe that, in years to come, we shall still be faced with the problem of pollution by hydrocarbons. There will still be the problems of lead, and of nitrogen oxides and all those mentioned by Mr. Sibenaler.

Intervention of Mr. ZANONI

As representative of an oil company I am of course very glad of all the help being given by other bodies towards the planning of our future activities. As regards the future of hydrocarbons, I should just like to say that in my paper I quoted data which I believe are reliable; they came from the European Community's Directorate-General for Energy, and on the basis of those data one can form a certain idea of the future energy picture in the Common Market in 1980-85. I realise that all forecasts very often need correcting later on, but I hope the Community forecasts will not need too much altering. Next, as to the "pipe-dream" substitute for hydrocarbons that will solve all our problems, I too hope it will be found; but I should like to clear up one point regarding my statement that hydrocarbons are and ought to be used principally in the transport sector. The first thing to remember is that our vehicles have a certain average lifetime, 11,5 years in the Community. Secondly, we use fuels for vehicles and also, for instance, for power stations. I wish all those admirable people who calculate the amount of fuel burnt each year by a motor-vehicle and by a power station would consider this point - in order to use a given number of tons of, say, methanol it would be necessary either to modify several thousands of vehicles already in use or to modify a few dozen power-station burners. I believe is more logical to aim at converting a dozen power-station burners, rather than some thousand or more vehicles. So, when I said we need to use hydrocarbons as much as possible in transport, it was largely because the vehicles are already on our roads today and havee been designed to work with these fuels.

Mr. Montabone

I only want to say that so far research on lead traps has been done only by the industries that found it worth their while. Now the automobile industry wants to study them, but this is work that will have to be taken up by everybody and it is no good thinking that it has already been finished.

Intervention of Mr. CHEVENEZ

I would like to ask Mr. Sibenaler a question, as he has recommended the use of lead traps and has asked the Communities to finance a study of these divices. Before taking such a decision is it not necessary to evaluate first of all the actual harm caused by lead emissions and, secondly, assuming that it really is harmful, to compare the relative costs of lead traps, including maintenance, and a reducing of the lead content of fuel ? Mr. Lemaigre has spoken about such a reduction. Would it not be as effective as using a lead trap without having the same disadvantages ?

Answer of Mr. SIBENALER

As far as evaluation of the real toxic danger of lead emission is concerned, I can say that committees have been set up in most countries to deal with this problem and to try and determine, at least with regard to the air, the level at which there is a risk to health. I believe that it is not yet possible to quantify this level although the figure of 20 microgrammes per m3 in the atmosphere has been suggested and represents the maximum level found in towns. The question of whether this level is harmful to man is being examined and I cannot say whether the figure is realistic or not. As far as lead traps are concerned they allow vehicles to maintain their present performance and flexibility and they make it unnecessary to expend too much extra crude oil in order to produce petrol with a reduced lead content. This is why I say in my report that a directive limiting the lead content of petrol too severely is not to be recommended at present and that until public health specialists and others in the health field come to a decision on toxicity in the air it will be useful to further the development of lead traps which have already reached an advanced stage.

There are still some problems to be solved, such as purging after accumulation in town driving, bulk with respect to small cars and perhaps also a problem of price. If the present situation is examined from the economic point of view it must be seen that the lead trap is more economical than banning lead in petrol. I can illustrate this point by quoting studies carried out in independent laboratories. Tests carried out by UTAC have shown conclusively that performance, noise and gaseous pollution from motor vehicles in practice remain unchanged when the ordinary silencer is replaced by lead traps, and these figures are valid for a full 31 000 km test run. The trap reduces the lead level by about 65%; at 31 000 km this figure is still 60%. Also, another study from Britain shows that lead emission from motor vehicles equipped with a lead trap and running on fuel with a lead content of 0.52 grammes per litre is as a rule, the same as that produced when fuel with a lead content of 0.3 grammes per litre is used with conventional exhaust systems. The devices appears to have a lifetime of more than 38 000 km. On the basis of a 60 000 km life the increase in the price of a car would be between 1 and 2.3%.

Intervention of Mr. CHEVENEZ

I think we are misunderstanding each other. I have absolutely no fault to find with the figures that Mr. Sibenaler has just given. It is evident that a lead trap does not reduce vehicle performance. Mr. Sibenaler has just said himself that a number of problems remain to be solved concerning lead traps, including that of cost. My question was only whether it would not be desirable, before taking the decision to finance development of lead traps at the expense of the Community; since the question of cost has not been solved, to establish whether the same result cannot perhaps be obtained by a reduction of the lead content of petrol, and also whether it is worth reducing this level unless there really is a problem caused by the harmful effects of lead emissions. Until this has been established it seems to me quite useless to develop lead traps for vehicles.

Intervention of Mr. MACKAY

The question of Mr. Nelson is :
Would I agree that in the future EEC Restraint Systems Approvals should be applied by the vehicle manufacturer only ?
The reason for this question is that I pointed out that the seat belt characteristics and the characteristics of the front part of the vehicle structure should be regarded as a whole because only then will the human being during a commotion undergo the least possible strain; the question applies also to head restraints and to vehicle seats.
My answer is that, as we go towards a whole vehicle tests, then it becomes necessary to examine not just the various component parts; future directives must be written in terms of the restraint system coupled with the vehicle structure and the vehicle dimensions. The short answer to the question is, in a long term, "yes".
There must be perhaps some intermediate stage, where there is a more generalized test of the Restraint System against some standard impulse, for example, deceleration impulse.

But in a long term, certainly one must, in a technical sense, test the whole system.

There is a question of Mr. Grunwald from the Federation of Danish Motorists, referring to some remarks that I made about Child Restraint Systems in my written paper, where I say that people are prepared to pay for the better level of protection and where I suggest that stringent requirements may discourage manufacturers from entering the market.

From this follow two questions :

1. My statement seems to indicate that the EEC may confine itself to giving advice to consumers on optional equipment quality. Why not therefore

give advice in the form of stringent type approval requirements, possibly to various levels of protection.

2. The second question is if there are very considerable reservations against the Swedish requirements in my report and why ?

I will answer very briefly.

The difficulty with Child Restraint Systems is that we are producing a requirement for a piece of equipment whichis optional. I think, with no suggestion to anybody, that there should be any compulsion about people choosing Child Restraint Systems.

The danger is that, if we develop a tremendously high performance standard which leads to a very expensive device, we will perhaps merely reduce the number of people who choose to buy and use it. And this is one of the limitations perhaps on producing the ultimate in a performance standard, if it carries with it very large cost penalties.

One solution is to have various levels of protection; this might be one of the options which could develop from a directive on Child Restraint Systems.

I will personally be rather doubtful that that would be a particularly acceptable method of proceeding.

With regard to the second question, I think the answer is contained in what I said before.

Intervention of Mr. HOFFERBERTH

I wanted to comment briefly on Mr. Andreasen's observations on the road traffic accidents statistic Seminar. Unfortunately, I was not able to attend that Seminar. But if I understand his conclusions, he suggests that two systems of data collection be established. One, a general system relying primarily on police investigations as its source of information. The second a more detailed series of investigations looking into specific problems in depth, and his suggestion is that that be handled on a"come as can" basis and that the Commission takes a way of helping to discriminate data resulting from the specific studies.

We have for some time in the U.S. had a similar system, one incorporating the gathering of general data, primarily from police reports and State and local investigation files and secondly, more in depth, studies of specific problems which we refer to in the U.S. as a local accident investigation system. This looks very well, but we have learned from our experience and we have determined some of the short-comings of what we have been doing. It may be that you can benefit from our experience here. But in the course of the work, two things have to happen :

1. You have to be measuring the proper parameters in the detailed studies. You must be very sure that you are measuring those things that are important for determining and defining the performance of the various sub-systems and systems that you are attempting to evaluate.

2. You must be able to relate the overall data file to establish the scope of the magnitude of the problem. You must be able to relate the specific problems to that overall data file. What this ultimately comes down to is that you have to relate the specific parameters in the detailed studies to the overall data file.

Of course it is impossible to measure these detailed parameters and the overall general data file; that is not resaonable at any price.

What we are coming to in the U.S. is a determination that we need to very carefully design the sampling strategy and the sampling plan for collecting the detailed data, in addition to making sure that we are collecting precisely the right parameters as we collect that detailed data. Without this, it is very difficult to come to real evaluations and analyses of systems, if it matters not whether we are going to perform cost-benefit studies or coast-effectiveness studies.

Ultimately, we will want to look at the effectiveness of what we have done and what we are trying to do. Without knowing what the correct parameters are and how they are represented in the environment, it is very difficult to do this.

Those are the things for the Commission or someone to consider if they undertake a study similar to the one we have done in the U.S. : to carefully consider the design at least this provides some coordination in the direction of the detailed studies; try not to let them evolve on an ad hoc basis; help them to evolve in a way that will represent the environment.

Intervention of Mr. BRAUN

On behalf of Mr. Dieleman and for myself I would like to comment on the fact that everyone seems to have been in agreement throughout our discussions on the fact that wearing safety-belts is at present one of the best ways of diminishing the consequences of road accidents.

Mr. Dieleman suggests that in this respect manufacturers give their wholehearted support to governments and to all those who, by advertising or other methods, do their best to encourage correct wearing of belts. Therefore it would be correct to say that everyone believes that wearing safety-belts is today an important and obvious factor in reducing accidents and that those governments that have not yet done so are strongly recommended to make it compulsory.

Intervention of Mr. BOSCHETTI

I would just like to comment on Mr. Mitschke's speech concerning lighting. Lighting specialists in the automobile industry believe that there were once many badly lit vehicles, but that now we have gone further than is reasonable and that the profusion of lights is beginning to create confusion. Therefore, we are asking that the addition of new lights should not be considered without an accompanying effort to delete others.

I would also like to draw your attention to another problem which concerns the "lighting" directive as it does others, i.e., the sometimes considerable delay occurring before certain directives are adopted. We believe that the cause of this is perhaps that certain directives are excessively ambitious and try to meet the widely differing requirements of different countries. Manufacturers would like to see another method adopted : a first directive made as simple as possible would be implemented very quickly and, at the same time, a supplementary directive could be issued to be implemented in one, two or four years, which would include all those points that need to be discussed more fully before being agreed on.

I would like to make a final point about speed limits. We all know that blanket speed limits have reduced the number of dead and injured very significantly because they have not only reduced legal maximum speeds but also actual average maximum speeds. I believe that it should not be forgotten that a large number of accidents have been taking place for a long time where speed limits are in force and traffic conditions are normal. What counts therefore is the safe speed of traffic and not always the legal speed limit. In all the studies requested by the Symposium on this subject more attention should be drawn towards the use of technical limitations to traffic speed.

But we do not believe that because maximum speeds are limited that we must limit technical progress in vehicles. On the contrary, drivers must be educated so that technical improvements to cars provide a supplementary safety margin and do not encourage them to use to the maximum the new performance open to them.

SUMMARY OF CONCLUSIONS AND DEFINITION OF PRIORITIES

By Mr F. BRAUN

Any attempt to draw some provisional conclusions from a symposium which was intented essentially to give us food for thought rather than for an immediate basis for conclusions (the thinking would, in any case stop a little too quickly if the conclusions had all to be drawn today), any provisional conclusion, then, that can now be drawn may seem to you, in certain respects, to be a repetition of arguments that you have heard during the last 4 days, and so I would ask you to excuse me for this in advance. In a short time, perhaps, you will once again rediscover, in the address as delivered by Mr Dreyfus and Mr Gundelach some of the points that you raised during this symposium and that I also am going to bring up.

I should first like to stress an initial positive aspect of this symposium. On Tuesday morning, before arriving here, I asked myself whether it were actually possible to impose such a searing pace on the participants for 4 days; I believe that we have exceeded the agenda for each session by one hour, which should certainly amount to 8 or 9 hours of work per day. I would therefore first at all like to congratulate you on your remarkable assiduity. It was perhaps easier for you than for me and a number of others, because you were working in a field, a part of which you knew by heart, while for us it was sometimes a question of learning at your feet. I am here excluding Mr Verdiani, who knows his job inside out.

But I believe that what has been most important is to have succeeded through thus symposium in bringing together men who, from time to time, have different objectives not in climate of confrontation, but in one of openness and discussion. Health protection, protection of the environment and safety can clash with economic objectives. Those whose aims are to protect health, and the environment and to promote safety tend to think that there is always a possibility of succeeding when one really wishes to succeed, that where there is an objective there must also be a will to achieve it, and doubtless they are often right. On the other hand, the manufactures feel that every amendment made to the regulations obliges them to do more than technology allows - even though this has not been truly confirmed in the past. But I believe that, in the future, this concern, which is due more to non-European experience than to European experience, must not be under-estimated.

The fact that many of the participants have been able to express their points of view so amply during these 4 days is, in itself, a positive factor and, I hasten to add, we would not wish to lose the benefit of this by allowing this symposium to break up without our assuring you that we are certainly thinking of following it up. This sequel will not necessarily be a symposium and certainly not a symposium of this size, but will consist of the resumption, with some of you, chosen perhaps on a more restrictive basis, of a given speech or discussion.

The second remark that I wanted to make is that the conclusions drawn from the different sessions have opened up or have sought to open up, not in all cases but in many of them, a way enabling the two schools of thought emerging from this symposium to be taken into account. Although this symposium was not marked by unanimity, middle ways were sought and there was a tendency to clarify positions that were based on scientific experience.

I believe that we can all subscribe to the necessity for supplementing the directives on harmonization in order to arrive at the type-approval of the European motor car. We all know that this should happen about two years from now, bearing in mind the deadlines that it is necassary to lay down for putting each of our directives into effect. Everyone will thus admit that there are gaps to be bridged. For example, the Commission has not yet made any proposals on tyres; the Council of Ministers, for its part, has not yet delivered its opinion on certain other directives, including that on restraint systems and safety glass.

We also noted that many of you considered that some of our proposals and some of the decisions taken by the Council, had turned out, in the light of experience, to be badly adapted to reality. It would be true for certain tests, and in particular, those where it was suggested that the experience gained should be taken into account more completely. In this instance, we have the means, that is the procedure for adaptation to technical progress.

I do not mean to say that we are necessarily going to adopt everything that has been suggested, because some of the remarks could have been coloured by rather one-sided experience, but our own position is very open and I imagine that this is also the case with the representatives of the Member States who took part in this discussion. Even when the gaps that I have just pointed out have been bridged, we will still not have arrived at the stage where it could be said "we now have a number of years ahead of us to think, to carry out research, and to lay down at our leisure directives of another type", which in any case would be subject to much longer-term application deadlines; in fact, the new generation of directives would enter into force some time during the period 1985-90. In other words, there can be no lack of continuity in the drawing-up of regulations.
In addition, the Member States - quite apart from any judgment that the Commission may make in this connection - believe that there are several problems of immediate or medium-term urgency for which it is not possible to lay down long-term deadlines.
Despite the statements opposing an immediate changeover from the "construction standard" to the "performance standard", the importance and the advantages of performance standards have certainly been stressed. I do not believe that I am very wrong in saying taht, in principal , a favourable option exists for a smooth changeover to the second type of standard within the shortest time possible and on each occasion that the opportunity arises.

The reservations expressed thus do not concern performance standards as such but the fact that there would have to be nothing between the current standards and the future performance standards. On the contrary, although this changeover is designed to be a gradual shift in the form of successive replacements, (where appropriate, by immediate application of a performance standard when no construction standard exists and it appears that this is both possible and useful) you will doubtless see a major rapprochement between the conceptions which, at the start, could have been or could have seemed contradictory.

Even on the occasions when the will to push on towards performance standards made its appearance - this very clearly resulted not only from Mr Mackay's report but also from that by Mr Taylor - when the immediate priorities which had to be dealt with were presented, it was observed that what one was faced with was probably still construction rather than performance standards. For example, it seems to me that the height of the bumper is currently more a matter for a construction standard than for a performance standard; further, when Mr Furness tells us that, for the British Government, the protection of children has immediate priority, I do not see how this could be done immediately, as of now, by means of a performance standard.

I do not wish to continue with comments on problems that require more detailed thought, such as lead traps and the desirability for the Commission to carry out research in this field at this stage; I share a number of Mr Chevenet's concerns with regard to cost, but, to a certain extent, I do not share, another point of view, namely that it has not yet been demonstrated that presence of lead in the atmosphere must be reduced and that in addition, this must be done by reducing its content in the exhaust gases from motor cars. Although I share his point of view that it is not certain that the lead trap is the ideal solution, I am, on the other hand, very certain that no Member State will want, over a 4-years period, to allow the percentage of lead in the atmosphere in our towns to continue to increase unchecked. By this I mean that, if the lead trap appears likely to remedy this situation, we must seriously undertake to study it. The other question is, however, to find out what the cost-effectiveness and cost-benefit ratios are before undertaking more advanced studies in this field.

Mr Chairman, in my opinion, a particularly useful and important conversation has taken place. I had noted still further problems, but I know that either Mr Rossi or Mr Gundelach or else yourselves will, in one way or another, bring them up. For the moment, I should therefore like to stop here. However, as I will no longer be able to do so in a while, allow me to thank you for the contribution that you made to this symposium. I trust that you have also derived some benefit, in terms of the relations that you were able to establish, and of the knowledge that you have acquired of the ideas in other sectors. We should be very happy if you felt with us that everbody has benefited from this symposium. For our part, we certainly have.

You are aware that we owe much to our rapporteurs and to the Members of the panels, since, if the reports and the remarks of the panelists had been of a lesser quality, the concentrated interest of the assembly would have dissolved.

I should now like to say a few words to my collaborators : a week ago I told them, when I feared that we would not manage to achieve in concrete terms what we have just achieved, that I was washing my hands of it all and that the responsibility was theirs alone. Since everything has gone so well, I should like to say now before everyone that I do not claim for myself the congratulations that we owe to them, im particular to Mr Verdiani and his team. The symposium has succeeded very well from every point of view and I offer you my thanks, those of the Commission and also those of all present here for the continuous effort that you have made for two or three months, and in particular, during the last 10 days.

Thank you very much.

Intervention of Mr DREYFUS

President of the Committee of Common Market

Automobile Constructors

Ladies and Gentlemen,

I would like to thank the Commission of the EEC for having invited me to express, in the capacity of an expert, the opinion of the European Motor Industry upon the work of the Symposium.

In doing this, I bear in mind that I preside over the CCMC, whose members have - for several years - been endeavouring to bring together scientific and technical knowledge concerning the problems dealt with by the Symposium. This knowledge is put at the disposal of both the Governments of the Member States and of the Community Council and Commission. The experts of the CCMC member companies have, I believe, made their contribution to the work of the Symposium.

The vehicle manufacturers are very conscious of the nuisances involved in the use of the automobile. It is for this reason that they are searching for ways and means to reduce these nuisances. A great deal of time and money is devoted to this research. It is very clear that they would like this time and money to be used as efficiently as possible. It is in their interest. It is in that of the consumer. It is in the interest of the community as a whole.

In this respect, the manufacturers do not readily understand why a given car model which is basically identical and which, for most manufacturers, is being sold in many countries, is affected by technical regulations which differ from country to country. Their astonishment is particularly marked when the countries in question, such as those of the European Economic Community, are united in a single economic zone, and where the conditions of use of the automobile do not differ significantly.

The European Community has already adopted some fifteen Community Directives. This constitutes real progress, and it is welcomed by the manufacturers. There are some ten more to be adopted, I think, to terminate a first phase.

But how can it be explained that the regulations which have already been adopted are, in practice, frequently applied in a different manner in the various countries ?

This would seem abnormal, if these regulations were developed on the basis of well-founded scientific and technical studies.

It would seem advisable to us that prior to the establishment of new regulations, it should be ensured that those already in existence are applied in a uniform manner in all the Community countries. We express the wish that this first effort should be accomplished and brought to a conclusion, so that the unique Community Type Approval, valid for all Member States of the European Community, becomes a practical rule.

In this respect, I would like to formulate a concrete proposal. I would suggest that - without awaiting the adoption of the totality of the directives which constitute the current phase- the European Economic Community should decide, for a transitory period which could, for example, last for three years from I January 1977, that there would be applied, within the Community and on an experimental basis, a reciprocal model homologation. This homologation would be granted by one of the Community countries for all the others on the basis of the existing directives and - for those areas not yet covered by directives- on the basis of the national regulations of the country granting the Community homologation. I would ask that this proposal be examined rapidly by the Member States and the Commission.

It will then be necessary to continue progressing, to reduce accidents and to attenuate the nuisances in the pollution and noise fields. This was, I think, the essential objective of the Symposium.

Let us not forget, however, that the automobile itself is not solely in question. It is also necessary to improve the situation with respect to traffic, the road system, even the structure of cities etc.

With respect to the automobile, we have several wishes to put forward :

1. We would like to see tomorrow's regulations based upon thorough cost/benefit and cost/effectiveness studies. These notions are of capital importance. May I recall the difference between them ? In the case of pollution reduction for example, we know that modifying the mechanics of an automobile in a certain way and at a certain price, reduces by a certain percentage the emission of a given gas. This is the cost/effectiveness.

   But, on the other hand, the improvement in public health achieved by the emission reduction in point must also be evaluated. This is the cost/benefit. In certain cases, these two notions are more or less the same.

   In others, they are quite different. And it is more difficult to calculate the relationship between the cost and the benefit to the community than that between the cost and the effectiveness.

The manufacturers are familiar with these notions. We are glad to see that the Public Authorities are taking them into consideration.

For their part, the manufacturers are ready to make the necessary contribution to these studies. It is becoming, in my opinion, more and more important that these studies should be accomplished with great care.

Until now, in fact, the application of regulations has not entailed substantial modifications to the automobile. In the future phase, that of the 80's, this will probably not be the case. It is possible that compliance with regulations will, in the future, necessitate the modification of relatively fundamental parts of the automobile.

To influence, in this way, the concept of as widely spread a consumer product as the automobile lays a heavy responsibility upon the Governments. No mistakes should be made, for otherwise - what wastage and what dangerous consequences would be risked.

It seems to me that the report established by the European Experimental Vehicles Comittee for the London E.S.V. Conference could form a good basis for work.

2. We would also like a synthesis of the regulations relevant to the fields concerned - safety, pollution, noise - to be made so that contradictions may be avoided and priorities established. Everything cannot be done at the same time, not only from the technical aspect, but also from the point of view of economics. In this respect, we may possibly set ourselves a rule : for example, that the total cost of new technical regulations coming into effect each year, shall not augment the price of the automobile by more than x% per year.

   I leave this idea for you to reflect upon. Another formula could also, perhaps, be imagined, for example that a central institution, at Community level, would set the priorities taking into account the necessary technical and economic considerations.

3. It is equally necessary that regulations be known a long time in advance. The more time that is available, the better the product may be adapted to the new rules.

4. Finally, the economic, social, financial situation of an industry which is fundamental to the European Economy, must be taken into consideration.

   We are constantly involded in resolving contradictions.

To give a few examples :

- pollution reduction may conflict with the determination to reduce petrol consumption;
- noise reduction may be incompatible with the determination to economize in raw materials;
- the desire for a longer vehicle life is incompatible with the most rapid application possible of the regulations as they evolve;
- etc...

It takes time to resolve these contradictions and to extract good solutions, and it would seem to us - for the multiplicity of reasons which I have just mentioned - that a pause should be observed after the adoption of all the Community Directives currently under development, before tackling a new phase. This new phase is already in preparation. The directives which will correspond to this new phase must be approved as rapidly as possible, but should not, however, become compulsory before the 80's.

Finally, a last point. The directives of tomorrow must be prepared for the geographic zone of the Community. However, it is essential that, according to the appropriate procedures, the maximum effort be exerted in order that the regulations should be identical over as wide a zone as possible, including particularly the European countries which are not members of the Community.

The Symposium has been interesting, and I do not doubt that it will permit the deduction of a certain number of basic ideas for future regulations.

In my opinion, one of its most positive elements is the fact of having brought together the representatives of the Public Authorities, independent experts and representatives of industry.

It is from the very close cooperation between these responsible sectors that must result the real progress in the path which we all pursue.

INTERVENTION OF MR. ROSSI

In the name of MR. MARTINELLI

President of the Council of Transport

Ministers of the European Community

On behalf of Senator Martinelli, Italian Minister of Transport and present President of the Council of Transport Ministers of the European Community, who was unable to put off his official duties and, therefore, unable to speak personally at the conference, I am pleased to have this opportunity to extend a cordial welcome to everybody attending this conference and to make some remarks as regards the results which have emerged during the symposium.

As representative of a country which is highly concerned in any matter connected with the motor vehicle sector, the Italian Minister of Transport will take an action so that on the basis of all the suggestions, proposals and requests that have emerged from the discussions which have taken place here, a more energetic and vigorous action will be carried out at Community level in a sector which plays such a vital role in the European economy.

I must add the compliments of my Minister for the high contributions to the technical and social progress given by all the participants.

I would then like to express my most sincere appreciation to the organizers of the symposium for having arranged it at such an opportune moment. It has ensured that general attention has now been focused on a problem which has been allowed to lie dormant for several years but which is now displaying its full seriousness.

Events on the international scene in the past two years, the major economic troubles which, apart from a few rare exceptions, have affected the whole world and the shortage of raw materials, particularly of energy, has forced the government of the various countries to tackle the problems due to vehicle ownership in a completely different way from the past, albeit using a variety of methods.

In fact, insofar as difficulties emerges, the Rome Summit on 1-2 December last, jointly reaffirmed that suitable mechanisms must be found to protect existing energy sources and ensure the development of new ones on reasonable economic terms for the Community and to encourage energy conservation.

As regards protection of the environment, the work is at a more advanced stage and the Council has already been called upon to decide on a number of proposals prepared by the Commission.

The need to set up an overall policy in the field of regulations on motor vehicles was corroborated by all the speakers and, with even greater authority, by Mr Gundelach; I need add nothing more on this subject except my conviction that this aim will be more easily pursued if our effort is to be matched by appropriate diligence at the political level.

Turning now to the merits of the arguments put forward and in particular to the steps already taken at Community level in regard to regulations concerning motor vehicle design and the lines indicated for a future action programme, it may perhaps be useful to consider the role that the Council of the European Communities has played in this field and, the practical steps already taken by the Member States to implement the Community type-approval system; nor would a few comments be out of place regarding the consequences which the introduction of this system has produced and may generate in the future in Europe and throughout the world.

The Council, it will be remembered, had decided to carry through the 1969 programme, adopting on 21 May 1973 a Resolution which amplified it and on 17 December 1973 another Resolution concerning the industrial policy.

On the strength of these resolutions the Council should have issued decisions, on the basis of some 25-30 proposals a year for <u>the entire sector</u>, on <u>technical barriers</u> to trade in industrial products.

In point of fact this programme was not fully implemented, but on the other hand it is not really surprising that some measures make laboured progress, especially where the only way to carry them through is by reconciling opposing needs or views in a compromise solution.

For the sake of better Community integration, however, it would be a good thing if greater impetus and higher speed could be given to the whole decision-making process.

A similar appeal should be made for greater vigour in the procedures for implementing the directives in the various Member States, for it is no secret that difficulties and delays in their acceptance still persist in some countries.

I readily admit that in the motor vehicle field such snags occurred in the past in my own country, but I can state as a fact that today the Italian requirements are completely in line with those issued up to now by the Community.

Consequently we must hope that everyone will do his part to bring a Community type-approval system into being as quickly as possible, its advantages are so obvious that there is no need to enumerate them.

Meanwhile, we should appreciate the effort expended, all the more because, as Mr Gundelach opportunely reminded us, the starting material was a collection of dissimilar or even conflicting regulations.

It is not for me to tell you, who are experts on the subject, that to have succeeded, by patiently smoothing away the obstacles, in harmonizing a widely differing range of measures concerning the design and means of control of vehicles has, in many cases, greatly facilitated the industry's work programmes and enabled them to supply better products.

In my opinion, therefore, everything suggests that it is unquestionably advisable to continue along this path, in order to extend Community harmonization to other means of road transport not yet covered by rules.

Before closing I should draw your attention to another aspect of the problem, which does not have economic effects only, but can create beneficial repercussions in a far wider field. It must not be forgotten that the European Community does not operate in the abstract, in a void, but in a market economy and consequently any decision taken at Community level is ultimately bound to have a practical effect on the economy of other countries and vice versa.

To be precise, I am referring to the influence which the Community regulations, tested by positive experience, will inevitably develop in world trade in the course of time.

In this, so to speak, indirect manner the Community will thus be able to prompt certain choices in countries outside its ambit, with obvious advantage for our manufacturers who, being able to count on a uniform trading area both inside and outside the Community, will not have to diversify their production destined for non-Community markets.

More incisive action can be developed in this field, especially if the work can be better coordinated and adjusted to fit with the parallel work being done in other international organizations, in the same sectors but with a greater number of European and non-European States taking part.

It is clear that in this field the Community will in future have a more important role than it has played hitherto, for it will undeniably carry great weight at world level if only because Community vehicle production amounts to almost one-third of world production.

It is therefore to be hoped that the Community will promote the appropriate measures by proposing standards whose final field of application will extend far beyond that of the nine Member States.

To attain such an important objective properly, however, will not only require commitment and a firm political will but, as a preliminary, will need to be backed by sound technical solutions that are acceptable in terms of safety, protection of the environment, rational use of energy, and appreciable savings as regards cost and so forth.

But above all other factors the one essential for attainment of so important an aim is certainly the combined drive obtainable from even closer, more concerted collaboration than today between government offices, industry and Community organs, all consciously and responsibly united in a broader purpose than that pursued hitherto, in a word, a truly European purpose.

CLOSING SPEECH

by Mr F. O. GUNDELACH

Member of the Commission

Throughout the symposium I have been kept informed of the main lines of your debate and conclusions. I am happy to say that as a result at the high level of your discussions the Commission now has a very valuable addition to its knowledge in this field which will facilitate in an important way our thinking on the shaping of the future policy.

First of all, I think that it has clearly emerged from our discussions over the past few days that it is vital to concentrate our efforts to get the Directives that are still missing from the overall EEC type approval procedure either proposed or adopted as soon as possible. This is an absolute priority for us and we will do everything within our means to have this accomplished. However, I think it will not be enough to content ourselves with the establishment of EEC type-approval procedures in the near future.

We must develop this system further but we are now able to do this on the basis of a set of common Community legislation and not any more by the way of harmonising varying national legislations.

A number of speakers - particularly manufacturers' representatives and also representatives of certain Member States - have put forward the idea that we should now leave the so-called optional approximation method currently applied in the vehicle directives and go over to the total method, which would mean that Member States could no longer keep their national laws alongside Community ones. I was interested to note this attitude and I can assure you that we will take this into consideration along with other views that have been expressed.

So far in fact, the optional method has, with one or two exceptions, been the only one adopted in the sector of free movement of goods and in the vehicle sector in particular. When the first directives on vehicles went before the Council, the optional method seemed the best overall method and that in addition economies of scale would direct manufacturers towards the Community solution. It is conceivable that, once the EEC type-approval procedure has been completed and put into practice, it might well be possible to adopt total harmonisation, particularly where the aspects of safety, public health, and the environment are predominant. But I should like to stress the fact that, in this particular field, the Commission has not a rigid position on the method of harmonization chosen but that we would normally seek the most practicable solution.

In saying this I would further emphasise that the overall view of the Commission on the use of the optional method of harmonisation in its work remains unchanged in these areas where safety or similar considerations are not predominant and where total harmonisation could limit consumer choice or result in the disappearance of regional specialities.

Previous speakers have touched on a thorny problem which has been bothering us for some time - the sometimes erroneous or, at least unsatisfactory, way in which Community directives are transposed into national law in certain Member States.

This is a problem which the Commission had to face as early as 1972 and I must say that our efforts to date have been crowned with a certain amount of success.

As the representative of Mr. MARTINELLI has said, Italy has not always found it easy to transpose the directives into its own legislation; I am happy to say that a determined attack on this problem by the Italian authorities has now brought them from the bottom to the top of the list.

I can assure you that, in the future, we will accord greater priority to ensuring the transposition of directives into the respective national legislations and in addition we will do our utmost to maintain the atmosphere of collaboration and confidence that is also necessary for a speedy and proper implementation of directives. It is not just a question of the legislative transposition of directives but to complete the process it is essential that the approval of the vehicle prototype by the relevant departments is swiftly carried out. Certainly for the manufacturers this is the most important aspect since it represents practical application of the directive.

I think that action should be planned at Community level, to avoid varying interpretations of directives when they are implemented. The most reasonable solution, in my opinion, might well be for national officials responsible for approval to meet regularly, or whenever there is a specific problem of interpretation, in order to settle the problem at Community level.

So far I have mainly been dealing with improvements to the existing legislation, but I would now like to add one or two remarks on the discussions concerning the concept of a car for the eighties.

I have had the impression that there are two main attitudes or philosophies which at first sight seem at variance. On one side are the supporters of what I shall call the pause for reflection theory which was expounded so ably by Mr. DREYFUS. Practically speaking, they are asking us, once the first set of directives are terminated, to provide a break in the work on approximation; only afterwards would they begin again with efforts oriented towards performance rather than design standards. In this event, the implementation periods would have to be rather long ones.

On the other side are the supporters of what I would call continuity. They are asking for the directive amendment process to be carried on and suggesting that, as the necessity for new legislation arises, the change-over from design standards to performance standards is achieved by a process of gradual evolution.

I can say clearly that the Commission is certainly willing to envisage the proposal of performance standards without dismissing continuity which I consider to be important.

I think that wherever possible the gradual changing of emphasis towards performance standards is acceptable but that it is important to envisage realistic implementation times that would enable industry to adjust its production smoothly.

Let me explain something here. I do not think that the Commission has ever introduced into any of its proposal to the Council time limits which were unreasonable or which industry was unable to cope with.

I should also add that the time between adoption and implementation in a number of existing directives was so long that we had to bring amendments to take account of technical progress before the directives could even be applied.

Of the points discussed, one - on restraint systems - struck me particularly. I think I am right in saying that every speaker has emphasized the need to make the wearing of seat belts compulsory. I am aware that this might give rise to problems of a psychological order in some Member States, but I do not think we should be held back by stumbling blocks of this type on a point which is of such prime importance for the preservation of human life.

I think, therefore that I am right in saying that a specific demand for the wearing of seatbelts to be made compulsory throughout the Community has emerged from this symposium.

I should mention here that the need for comparable national statistics has been stressed on a number of times throughout the symposium and I am very pleased at the success of the Seminar on the subject run parallel to the symposium. This has, in fact, highlighted needs in the various sectors more specially concerned with such data and will permit the Commission to draw up guidelines for further work in this field.

I have one more thing to add. I do not of course know what are your reactions at the end of the symposium. You have been active and constantly attentive participants, the rapporteurs have been extremely well prepared and their candour in putting what were often very different points of view has meant that the discussions have been lively and constructive.

We for our part think the symposium has been an important stage in the development of our work in that it has been, we consider, a unique opportunity for people with very diverse interests to explain their points of view and to take a step towards mutual understanding.

The Commission has no doubts about the success of this symposium judging from the amount and quality of your input. We will certainly ensure that when we get to the stage of output we will not fail to keep you adequately informed.

In concluding I would thank you all again for your active and fruitful participation and wish you a pleasant and safe journey home.

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