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REPORT

drawn up on behalf of the Committee
on Transport

on the role and the use of advanced and
new technologies in the field of
transport

Rapporteur: Mr F.A. WIJSENBEEK

PE 99.218/fin.

At its sitting of 11 March 1985, the European Parliament referred the motion for a resolution tabled by Mr ANASTASSOPOULOS on the role and the use of advanced and new technologies in the field of transport (Doc. 2-1732/84) pursuant to Rule 47 of the Rules of Procedure to the Committee on Transport as the committee responsible and to the Committee on Energy, Research and Technology for an opinion.

At its meeting of 18 June 1985, the Committee on Transport decided to draw up a report and appointed Mr WIJSENBEEK rapporteur.

At its sitting of 8 May 1985, the European Parliament referred the motion for a resolution tabled by Mr RAFTERY on intra-Community transport (Doc. B 2-231/85), pursuant to Rule 47 of the Rules of Procedure to the Committee on Transport as the committee responsible and to the Committee on Economic and Monetary Affairs and Industrial Policy for an opinion. At its meeting of 23-24 May 1985, the Committee on Transport decided not to draw up a report but to incorporate it into this report.

The Committee considered the draft report at its meeting of 18 July 1985 and 25 September 1985. At the last meeting it adopted the motion for a resolution as a whole unanimously.

The following took part in the vote: Mr ANASTASSOPOULOS, Chairman; Mr BUTTAFUOCO, Vice-chairman; Mr WIJSENBEEK, rapporteur; Mr EBEL; Mr NEWTON DUNN; Mr REMACLE; Mr ROUX; Mr STARITA; Mr STEVENSON; Mr STEWART (deputizing for Mr HUCKFIELD); Mr VISSER, Mr van der WAAL.

The opinion of the Committee on Energy, Research and Technology is attached.

The report was tabled on 27 September 1985.

The deadline for tabling amendments to this report will be indicated in the draft agenda for the part-session at which it will be debated.

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The Committee on Transport hereby submits to the European Parliament the following motion for a resolution together with explanatory statement:

A.

MOTION FOR A RESOLUTION

on the role and the use of advanced and new technologies in the fields of transport

The European Parliament,

- having regard to the motion for a resolution by:
  - Mr ANASTASSOPOULOS on the role and the use of advanced and new technologies in the field of transport (Doc. 2-1732/84),
  - Mr RAFTERY on intra-Community transport (Doc. B 2-231/85),

- having regard to the report of the Committee on Transport and the opinion of the Committee on Energy, Research and Technology (Doc. A 2-104/85),

A. recognising the determinate role new technologies have played in Europe's social-economic development since the 18th century in general and in the development of four distinct periods of transport systems in particular,

B. acknowledging the complex interplay of forces and events that follow the introduction of new or advanced technologies in the various modes of transport and their effects on the economic systems and employment, ethical values and life-styles,

C. aware of the pressing problems the Community faces today:
  a) moderate rates of growth and increasingly expensive energy,
  b) the highest unemployment rate since the Second World War,
  c) the lowest competitive edge in its exportables with respect to the U.S. and Japan,
  d) the widening technology gap with the U.S. and Japan coupled with its lost vitality and fragmented market,

D. convinced of the need to improve public transport services for the benefit of the important number of commuters within the various Member States and to promote employment mobility,

E. considering that the innate capacity of the Community to assimilate and its motivation to innovate in new modes of transport have historically been its comparative advantage which today are rendered doubtful,

1. Notes with regret that the Community has not made full use of its physical, educational and human capital resulting in a technological gap vis-à-vis its major competitors;

2. Welcomes the decisions of the European Council at the Milan Summit which:
   a) endorsed the Commission report on the strengthening of technological cooperation in Europe giving, thus, a new technological dimension to the Community,
   b) entrusted France to convene, in collaboration with the Presidency and the Commission, an ad hoc committee before July 14 to hold a session on European technology,
   c) defined broadly the areas of participation and cooperation, the role of technology in unifying the internal market but tied in with common policies, the means to reduce unnecessary duplication and the financing of a real technological Community;

3. Believes that the Commission's plan to prepare a special Treaty on the European "Technological Community" similar to Eurotom's alongside the Economic Community (EEC) and the Coal and Steel Community (ECSC) should be the principal item of the session on European technology and a decision ought to be taken within the framework of EUREKA;

4. Is convinced that the factors which are the prime movers of economic growth and social change are the same that shape the technological level; these are to a large extent past investments in inventive activities coupled with a consistant policy to promote innovation in a favourable environment;

5. Notes with satisfaction that the transport and telecommunications sectors are two of the ten themes proposed in the Commission's Memorandum entitled "Towards a technological Community"; expresses its concern, however, that neither were the criteria in selecting the projects nor the priorities of the Commission in promoting the new generation of transport systems and broadband telecommunications made public;

6. Proposes to the Commission that the following criteria should be adopted in its selection of the projects, with a view to:
   a) balance the physical ecology,
   b) minimise the travelling time of passengers and freight,
   c) improve the quality of transport service via increased speed, security and comfort,
   d) rationalise the cost of maintenance and production,
   e) encourage the mobility of factors of production and the flexibility of operating time,
   f) conserve energy,
   g) dissiminate information to all citizens;

7. Points also the fact, however, that the implementation of labour-saving measures should be subjected to a comprehensive cost-benefit analysis;

as regards road transport

8. Asks the Commission to encourage through its financing the development and adoption of computer systems for engine management; these computer systems introduce the advantage of emission control, improved performance and fuel economy through a microcomputer which continuously tunes the engine, adjusts the suspension, monitors the exhausts and controls maximum speed;

9. Calls for the introduction of Community fuel standards for road vehicles and stricter pollution standards with maximum permissible emissions of carbon monoxide, hydrocarbons and nitrogen oxides;

10. Believes that these standards would not only preserve ecological balance but also select the more efficient technology in adopting the three-way catalysts or the more spohisticated lean-burn engines; LPG must be considered to be an example of technology already in use, though LPG vehicles are banned from basements and underground car-parks as a safety precaution, which needs re-examination in view of common standards, bearing in mind that LPG devices have been improved and have a beneficial effect on the environment;

11. Urges the adoption of new techniques of road signalling which inform the drivers of dangerous weather (fog, rain, snow etc.) and of traffic flow conditions, including roadworks and other hazards, and the provision of park-and-ride facilities at the outer termini of urban transport services;

12. Stresses the fact that research into alternative means of transport which encourage better physical conditioning should be promoted and suggests the bicycle as being the more efficient mode in congested urban cities if separate cycle lanes are provided;

13. Points out that the development of better bicycle transmissions should be encouraged;

as regards rail transport

14. Considers the current efforts of individual member states (France, the Federal Republic of Germany, Britain and Italy) to develop their own rail technology separately counter-productive, because of the lack of coordination and because research is sparsely concentrated, duplication is inevitable and different conventional technologies fragment the Community market; this is contrary to the objectives of the Common Transport Policy viewing the systems of transport as means of integration;

15. Reminds the competent bodies of the Community and member states of the new developments in the field of railways such as the high-speed trains which can attain 360 km/h and, hence, this mode of transport remains the most competitive for distances up to 600 km;

16. Believes that the adoption of magnetic levitation for very-high-speed trains would progressively introduce similar advanced technologies in related activities resulting in technological externalities and consequently in improved utilisation of time;

17. Remains convinced that introduction of air-cushion trains not only would set off new interest in advanced technologies but, moreover, improve economic passenger welfare and economy and the allocation of resources;

18. Urges Community aid in the infrastructure field aiming at further development of conventional high-speed trains (eg. TGV, APT, ICE) and, after examination, unconventional high-speed new modes such as the magnetic leviation technology;

as regards sea transport

19. Is of the opinion that in order to steer the Community shipping in a positive and improved direction more emphasis on high technology is paramount;

20. Stresses the fact that hydrodynamic studies determining economical speeds and fuel-efficient engines would not only reduce costs but they would increase competitiveness;

21. Recommends the introduction of purpose-built shipping for the highly specialized transport of various CORO LASH ma erials, containers etc., reducing pollution hazards, the general risk of explosion and dangers associated with radioactive substances;

22. Urges greater attention to energy saving techniques in shipping;

as regards air transport

23. Observes that the new and advanced technology used in military aviation, such as electronics, micro-computers, automatic flight, guided aircraft departure when visibility is not good, should be the prime consideration of civil aviation;

24. Insists on the adoption of new technologies in seat reservation and coordination of flights so that full utilisation of the existing aircraft capacity be achieved;

25. Draws attention to the need for financing research to improve aircraft productivity, capacity, reduction in noise and energy efficiency; technical advances in subsonic jets would meet all four criteria pointing to the Concorde and Airbus technology equipped with noise reducing engines;

26. Believes firmly that expediting the movement of traffic into and out of airports requires the adoption of accurate radars in terminal areas, automated aids to the air traffic controller and microwave lamping system for guidance in cases of reduced visibility;

27. Considers the research on the security control mechanisms indispensable and points out that the existing X-rays control system of both luggage and passengers is inadequate;

as regards pipelines

28. Points out that the Community has not taken adequate consideration of this alternative mode of transport whose comparative advantage is due solely to its embodied new and advanced technologies;

29. Notes that this neglected mode of transport is more competitive over conventional modes in transporting slurry products (coal, ore, stone-pit products), is the most energy efficient in a period of energy crisis and is a desired contributor to ecological balance; and also completely eliminates unloading/reloading and breaks in the continuity of supplies,

30. Invites the Commission to research the technological advantages pipelines offer as an alternative transport taking into account the need to integrate peripheral regions with central ones and to reduce the cost of transportation of basic products to and from isolated regions, with a view to the maintenance and development of activities in these regions which all then combine to produce traffic and activities which benefit other modes of transport;

as regards telecommunications

31. Is pursuaded that, at a time when information is the direct source of our knowledge, it must be disseminated to all citizens of the Community; this is only possible if the new communications and transport technology are accessible to all regions of the Community;

32. Is convinced of the need to develop a European homogeneous telecommunications system with a single standard against which all indigenous suppliers could manufacture equipment and hence achieve economies of scale; in this quest the ESPRIT and RACE programmes are welcome;

33. Notes with satisfaction that the Community still holds on to its comparative advantage in telecommunications; it ought however to capitalise on technological innovation and thus create new types of economic activities; such innovative efforts should be directed to develop:
   a) the telematic system that combines computer and communications,
   b) the teleconferences that enable the communication between people separated by hundreds of kilometers,
   c) the cable television and large-screen video that converse and transmit documentation,
   d) the Integrated Broadband Communication (IBC) system capable of transmitting voice, data and image,
   e) the digital and electronic systems since they are compact, reliable and cheaper to produce;

   f) research into a direct language decoder (translator) to facilitate comprehension in different languages;

34. Proposes to the Commission to begin negotiations with Japanese and American suppliers of high technology telecommunications and informatics in order to allow access to Community market on a reciprocal basis;

as regards Community funding

35. Welcomes the proposal of the Commission to increase the current research budget of 2 per cent to 6 and 8 per cent over the next five years;

36. Requests the Commission to introduce, in its Budget 1987 5 MECU in a separate budget line only for transport projects, and another 4 MECU for telecommunications;

37. Asks its Committee on Budget to take already, for the Budget 1986, the necessary steps as far as those research projects are concerned;

38. Instructs its President to forward this resolution to the Council, the Commission, the Governments of the Member States and research Institutes concerned with high-technology transport and telecommunications.

B.

EXPLANATORY STATEMENT

I. Introduction

1. Greek mythology tells us that Prometheus, son of Iapetos and of the origin of Titanes, gave to mankind as presents: τη φωτιά (energy), and τις τέχνες (sciences). The name Prometheus means "foresee or anticipate"; η φωτιά for man has been the vehicle of his progress while οι τέχνες have been the application of knowledge.

   If both used for the welfare of a society - for it is equally possible to employ them for its destruction - Greek mythology held the view that man would become immortal like the Gods of Olympos.

2. In our "man made world", energy and science constitute the only reliable determinants in explaining the evolution of societies. Both factors are complementary in nature and constitute the elements of technological change.

   This should not be interpreted that industrial specialisation, financial innovation, intensity of effort or the institutional structure do not contribute to man's world. It should be interpreted to mean that as far as the transport sector is concerned, technological change should be considered as the more important growth factor. If technological change is identified with technological progress, then, it plays a determinant role in our societies; it affects positively economic growth and job creation; it advances social and cultural progress; it maintains ecological and environmental balance and increases security; it increases the innovative capacity of a region or of a State and thus lays the ground for increased competitiveness

3. In the context of this report, it is of interest to note that in a technologically changing world, the pursuit of economic growth without the accompaniment of the optimum institutional set up to safeguard social justice and equilibrium between the economic forces and social factors may lead to reducing overall welfare.

In the transport sector, the Community institutional set up - to an extent - has been defined by:

i) the three memoranda on the Common Transport Policy[1]

ii) the ruling of the Court of Justice of 22 May 1985[2]

iii) several directives and regulations[3]

4. As regards the field of transport, the two presents of Prometheus to man today could be taken to mean, on the one hand, the application of new or advanced technologies to the modes of transport and, on the other hand, the resulting technological change. These two factors have determined the evolution of transport and its four distinct periods of development.

The first period begins with the birth of transportation dated around 5000 B.C. by sheer muscular force.

The second period commences with the birth of the industrialisation era at the beginning of the 19th century and is characterised by the use of the physical-and-mechanical force; the steam-engine is its characteristic mode.

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1 Inland transport (COM(83)58 final)
Rapporteur Mr CAROSSINO - Doc. 1-1138/83, O.J. No 10, 16.1.84
Civil aviation (COM(84)72 final
Rapporteur Mr KLINKENBORG - Doc. A2-86/85
Maritime transport (COM(85)90 final
Rapporteur Mr STEWART

2 see Report on the judgement of the Court of Justice on the Common Transport Policy and the guidelines for that policy
Rapporteur Mr ANASTASSOPOULOS - Doc. A2-84/85

3 Council Decision of 13 May 1965 on "the harmonisation of certain provisions affecting competitions in transport by rail, road and inland waterways", O.J. No L 88, 24 May 1965, p. 1500

Council Directive No 74/561 of 12 November 1974 on "admission to the occupation of road haulage operator in national and international transport operations", O.J. No L 308, 19 November 1974, p. 23

The third period unfolds through the first-half of the 20th century in which motorization, mass production and human mind constitute the second industrial era.

The fourth period, the contemporary, has started since the end of the second world war in which we have experienced the "artificial intelligence"; that means the four constituents of the third period of industrialisation: electronics, computers, robotics and space.[4]

5. In this third period of industrialisation, the European Community is faced with fierce technological competition from the USA and Japan; in other words the problem at stake is how to keep pace with technological progress and how to adopt the growing intensity of competition by means of innovation.

A second serious problem that the Community faces is the highest unemployment rate since the Second World War.

A third, equally worrying problem, is the expected 1-2 per cent growth rate - the lowest for many years - of the Community gross domestic product until 1990.

Hence the role of new and advanced technologies in the fields of transport and communications assumes importance. The transport sector is rightly placed in the centre of the means required to:

a) contribute to the competitive edge the Community exportables ought to have in order to capture the new world markets,
b) reduce the high unemployment rate by becoming the growth sector for the Community as a whole.

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4 The papers presented at "The International Congress on Continental European Gateways: C.E.C. - What transports for which Regions?", from 24 to 26 September 1985, at Liege, Belgium, have provided the rapporteur with useful information and have given him valuable insights necessary for this report.

6. The interesting question to ask is whether the Community has the potential to create its own technology. Does it have sufficient resources? Are its resources optimally applied? Is the Community environment hospitable for advanced technology? How one increases the innovative capacity of a country or a region etc? Is participation a prerequisite to guarantee the interests of the smaller Member States? These are some of the questions raised in this report and some replies are attempted.

II. The Community in its International Context

7. In the Memorandum of the Commission on "the European Technology Community" the challenge facing Europe is stated forcefully. "Since 1972 the annual growth rate in real terms of the production of high technology goods in Europe has not exceeded 5% while the rate in the United States is 7,6% and in Japan 14%.
From 1973 to 1983 the Community's specialization index for trade in high technology products fell from 1,01 (OECD=1) to 0,8 while that of the United States remained constant at 1,26 and that of Japan went up from 0,7 to 1,26.
Europe's mediocre industrial performance has eroded its trade surplus in high-technology products. Over a 20-year period the export cover of high technology imports into the Community fell from 190% to 110% (1983)"[5] which still leaves it barely positive.

8. A casual reading of the above statement would say that the Community is missing out on the third industrial revolution while it was Europe that had launched the first and second industrial eras. Untiredless thinking would have us believe that the technological trend is irreversible hence the Community is deemed to find a less than an optimum solution.

Euro-pessimists would be quick to point out that a key index: the share of Community's exportables in high technology products shows a continuous decline.

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5 EUROPE Documents No 1363, 4 July 1985, p. 1-2

Index of technological specialisation

	1963	1970	1980
Community of Nine	1.02	0.94	0.88
U.S.A.	1.29	1.27	1.20
Japan	0.56	0.87	1.41

Source: B.Cardiff, "Technological Innovation in European Industry", Commission of the EC, January 1982

The above table confirms the Memorandum's statement. The share of the Community's exportables in high-technology goods has declined from 1.02 to 0.88 over a period of seventeen years; but so has the index of the USA but to a smaller degree; the exception to the rule is Japan: her index nearly tripled over the same period.

9. If, however, we examine the technological potential of the Community, we find that the Community lacks neither the human nor the financial resources. The rapporteur compiled the information provided in the article of Guido CARLI[6] in the following table:

Countries	Inhabitants	R & D expenditure	R&D/GDP	Research Staff	Res.Staff/Total
Community-9	260 m.	ECU 40 bil.	2.0%	1.100 m.	0.42
U.S.A.	230 m.	ECU 43 bil.	2.3%	1.520 m.	0.66
Japan	113 m.	ECU 15 bil.	2.0%	619 m.	0.54

One may draw the following conclusions from the above table:

a) the Community does not lack the resources. Both its human and financial capital are comparable to the USA and Japan.

b) the financial resources devoted to research and development in absolute amount is roughly equal in size to that of the USA and two-and-a-half times more than Japan's.

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6 Guido CARLI, "Investment and Technological Competitiveness" in EIB readings on "Investing in Europe's Future", Luxembourg 1983

10. On the other hand, if one examines the number of patent applications tabled at national patent offices in the Community, neither is the productivity per capita invested comparable with the main competitors of the Community nor is the inventiveness and technological dynamism of Europe high. In the cited paper in footnote No 6, Guido CARLI found: "Between 1965 and 1977 there was a noticeable decline in patent applications in all European countries except Ireland. There was also a slightly smaller decrease in the case of the United States. In Japan, on the other hand, patent applications by residents more than doubled. The trends are therefore very similar to those in world trade in high-technology products". (p.102)

11. Taking into account the size of the Community market, the surplus of human capital which is continuously drained to the USA, what is the problem at stake? Mr Guido CARLI takes it rightly by saying:
"It would therefore seem that the problem is a lack of effectiveness in applying the resources at the Community's disposal. Hence, any thoughts on ways of improving Europe's technological competitiveness must be preceded by an examination of the effectiveness of the constituent parts of the European R&D system (university laboratories, public research programmes and institutes, company laboratories) and the quality of the links between the different elements". (p.103)

12. Assuming that the "European Technology Community" becomes reality in the near future as the Milan European Council has pledged, some related questions should be raised:

    a) the aims of such a Community should be defined
    b) the relative benefits should be fairly distributed to the participants
    c) the means should be efficiently used, and
    d) the creation of a hospitable environment for advanced technology should be established.

III.How to exploit the Community Technological potential

13. The rapporteur welcomes the fourfold objectives stated in the communique of the Milan Summit; these are meant to:

- establish a close link between technological development and the effort to unify the internal market, for example by means of practical incentive measures such as the Eurotype proposal;
- ensure that the technological effort was closely tied in with common policies, in particular trade policy towards the Community's main partners;
- reduce the risk of unnecessary duplication of national efforts and assemble a critical mass of financial and human resources;
- obtain the maximum benefit from the immediately available Community technical and financial instruments, including those of the EIB.[7]

14. In order to achieve these objectives, the Community should assume the role of the initiator in a number of projects. For example it can act as a guarantor for venture capital for high-technology "start-up" companies and it could coordinate the research efforts undertaken by national institutes on projects initiated by the Community.

15. Acting as a guarantor or even participating in equity capital would encourage entrepreneurship vision and flair; in a sense it would help both big firms to pull efforts in the pre-competitive stage[8] and small sub-contractors to specialise in some activity. An example of this need is the telecommunications sector; in the U.S., telecommunications have been the fertile sector for high-technology venture capital and the springing up of new entrepreneurs.

16. How could the Community assist in coordinating dispersed national research? First by introducing a generous budget line in Community budget with sectoral sub-divisions. Second by defining the priority areas of research. Third by stimulating the twinning of university laboratories and thus establishing transnational teams.

What would this accomplish? A change of attitudes would be ensured; the distrust between academics and industrials because the former consider the latter "commercial" and the latter consider the former "theoretical and

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7 EUROPE, No 4121 (special edition), 30 June 1985

8 The ESPRIT project could be cited as an example

not practical" might disappear. If liaison bodies are created the universities can provide training, quitance and research for the corporate sector and industry could provide a steady financing of research responsive to future needs.

Furthermore Community financing of R and D through Community sector-contracts based on specified technical standards would avoid duplication or triplication of effort and would permit experimentation on a larger number of technological options; economies of scale and reduced administrative costs would free resources for technological trials and application of new technologies.

17. There is an overwhelming need to diversify research. The Community today invest about 90 per cent of public aid to R and D to four manufacturing branches: electrical engineering aerospace, computers and telecommunications. This overconcentration has hampered innovation in other sectors like transport, pharmaceuticals, etc. which are necessary for a balanced development and has rendered even these four sectors incapable of assimilating the technological advances independently developed by sectors like bitechnology or advanced electronics.

18. Today in the Community and the U.S.A., the cognition of mechanism and the skills of mechanics and technicians can be acquired through apprenticeships and through ad hoc training; all these are outside the system of formal education. In this domain, the Community could play an important role in promoting retraining of skills applicable to tomorrow's technological requirements through the Social Fund.

IV. Who Benefits What?

19. All Community initiatives have a cost and a benefit. In the case of a new technological impetus, the cost-benefit-analysis may be less relevant for it is the number of technical externalities which cannot be quantified; they weigh more and give a pronounced support to the creation of a technological Community.

The rapporteur would be inclined to propose three criteria that would ensure the equal distribution of benefits. These are:

a) the principle of Community preference

b) the use of the comparative advantage of a region or of a Member State, and

c) the promotion of the endogenous potential of a region or of a Member State

20. In its capacity of an initiator of both programmes of research and individual projects, the Commission should exercise the principle of Community preference. The rapporteur believes that this principle, mainly applicable to the agricultural sector, has served well the Community interests, has promoted the Community spirit and has advanced the integration our peoples. Hence participation in the technological Community presupposes adherence to the principle of Community preference.

21. The "comparative advantage" in the technological field is very relative but equally important since the allocation of Community funds should aim at its optimum. In a sense the technological comparative advantage of a region is interdependant upon its accumulated knowledge, practice, trends and customs which affect directly the cost. For example allocation of one project regarding advanced transport signalling to a research institute specialising in biotechnology would certainly result in misallocation of scarce resources.

22. Decentralisation of research would certainly reinforce the endogenous potential of regions which may have the technological capacity to promote advanced research but lack the institutional set up necessary to attract such research. Promoting local research would furthermore ensure strengthening of the economic base of a region and specialisation. This, in turn, would increase productivity and would enlarge the absorptive capacity of a Member State.

V. Sectoral Research and Efficiency

23. Long before the Commission took any interest in including the transport sector in its list of the 10 sectors that constitute the proposal for the creation of a technological Community, the Committee on Transport had already adopted in this programme of work the theme of this report.

The new generation of transport modes (Commission's preferred connotation) should be interpreted as being one that refers to the application of advanced and new technologies in the field of transport.

However one cannot choose that system of transport or the other unless one has a host of criteria upon which a rational decision is taken and upon which certain goals are supposed to be fulfilled.

Va. Criteria for appraisal of transport systems

24. New and advanced technologies adopted in contemporary systems of transport or future one should aim at the following objectives:

1. minimisation of production and maintenance cost;
2. improvement of the quality of the service through its increased speed, security and comfort;
3. promotion of environmental and ecological balance;
4. minimisation of travelling time.

25. Minimisation of travelling time and rationalisation of maintenance cost are correlated with those factors that contribute to competition. However competition should be seen in two distinct spheres that transport systems only introduce; the first sphere applies to the service transport offers and the second sphere referes to the industry of transport; the former introduces derived demand while the latter direct demand.

26. Security-comfort-speed have always been the three factors that have determined the choice of one mode of transport or another. The interesting question here is to promote that kind of research in new technologies that could assure all three or at least the two factors. In a competitive sector like transport, it is the quality of service that matters.

27. All efforts of industrialisation have hitherto resulted in ecological distruction and environmental demolition. The conventional modes of transport have equally contributed to such a state of ecological unbalance. Hence, any new generation of transport should enhance the ecological equilibrium and preserve those factors that promote the physical environment.

28. At the same time we should think of the future development of transport system meeting the requirement of the year 2000. What are the constraints? One could think of:

a) a moderate rate of growth implying the unlikely rates of growth seen in the 1960s; this implies a moderate rate of growth for transport demand;
b) an energy constraint both due to the expected amount of reserves, the technological capacity of the Community to develop alternative sources of energy and its expected price

29. Hence moderate rates of growth and dearer energy set the challenge for new or advanced technologies in the fields of transport and telecommunications. After all the major discoveries and technological revolutions in transport have been accomplished the moment an alternative energy source could be adopted in new systems of transport.

30. There is wide support for the argument that the transport systems of the next two decades would be of the same type and no major change should be expected in the energy field; non-oil energy sources, it is argued, would not be forthcoming and therefore only conservation of existing oil should be aimed at. Should this argument be proved correct, then one should examine the possibilities, technological and organisational, which would permit advanced technologies already available in some sectors in industry to be adopted in improved systems of transport.

Vb. Modes of transport and technological future

31. The Treaty of Rome designates to Parliament advisory and supervisory powers (Article 137) while to the Commission the role of the initiator as regards new policies among its executive powers (Article 155).

In the field of transport, however, Parliament has been more innovative than the Commission and often the voice of Parliament has had its impact on the proposals of the Commission. In this cooperative spirit, the rapporteur would suggest certain policies on each mode of transport which, he believes, could act as a stock of proposals for the new generation of transport.

Vc. Road transport

32. Road transport is synonym with the liberty of movement; such liberty is dependent on the cost of energy, conservation of the evnironment, improvement of security, increased comfort and conditions of infrastructure.
However, the future of the road transport heavily relies on the requirements of man of the year 2000. The intelligent car of tomorrow would be purely electronic: computers will be able to change gear, adjust the heating, turn on the lights and perform all the tasks necessary so that the engine meets the requirements of liberty of movement.

33. Current research is centred on ways and means of how to develop a sophisticated computer system installed in passenger cars which would control automatically and without any intervention of the driver
- the monitoring and tuning of the engine,
- the emission level,
- the suspension system and,
- the transmission management

Related to the above is the electronic ignition and fuel injection systems which would improve performance and fuel economy.

34. On the question of the Commission proposals regarding the pollutant emissions, the rapporteur supports the findings of its study:
"The Commission's study is based on the initial standards introduced on both sides of the Atlantic during the 1970s with a view to reducing emissions of nitrogen oxide and compares these with current American standards and the proposed European limits. The result of this comparison is that in percentage terms progress made in the United States and that expected on the basis of the Commission proposals is as follows (reduction of emissions):

	Cylinder capacity of vehicles	CO	HC+NO	NO
Community	small	62%	50%	45%
	medium-sized	80%	80%	73%
	large	87%	87%	70%
United States	all categories	91%	88%(1)	67%

(1)HC only

As regards nitrogen oxide (NO), which is believed to be particularly responsible for the withering away of forests, the study therefore shows that the proposed limits would provide for a 73% reduction in relation to initial standards for vehicles of medium-sized cylinder capacity, and a 70% reduction for vehicles with large cylinder capacity, as compared with the overall 67% for vehicles in the United States.

The average reduction of overall emissions of nitrogen oxide in the EEC would be 48%, this being a result of the 73% reduction for average-sized cars, the 70% reduction for large cars and the 45% reduction for small cars, with cylinder capacity below 1,400 cc, which constitute the majority of cars on the road in the Community. The percentages vary according to the Member States: 55% for West Germany, 50% for the United Kingdom, 44% for France and 37% for Italy (where small cars are predominant)".[9]

35. The controversy over the adoption of the "catalytic conventer" or the "lean-burn engines" technology should not cloud the issue at stake: the need to set out maximum permissible emissions of carbon monoxide, hydrocarbons (HC) and nitrogen oxides (NO) - the last being the most damaging pollutant - is overwhelming. Lean-burn engines can contribute both to reducing pollution and to improving fuel economy but the use of three-way catalysts offer the advantage of the immediate application. Both systems can be developed, starting from the fastest possible introduction of three-way catalytic converters on all cars while simultaneously developing "lean-burn engine" technology.

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9 EUROPE, No 4118 (new Series), 27 June 1985

36. Driving behaviour and speed have been two, most important factors as regards road security, accidents and traffic victims (killed or injured). Advanced technologies can monitor both. An electronic surveillance device attached to appropriate road-sides can monitor the number of vehicles, the speeds of vehicles and even driving offences such as crossing a solid white centre line. This is an advanced technology ready to be used, provided the Community has the will to monitor driving behaviour.

37. When we discuss alternative energy sources, we refer to the electric, non-pullutant car. When we talk of alternative modes of road transport, we refer to bicycles. In neither of the two, has research been promoted.

Bicycle makers have intensified their efforts to develop better transmission mechanisms for this older mode of transport. The Committee on Transport has already decided to draw up an own-initiative report on "cycles as an alternative means of transport" and it is expected that its rapporteur would develop comprehensively the relative comparative advantage cycles offer in congested urban cities and would comment on the new technologies applicable to cycles.

38. In the context of road infrastructure, new technologies of road signalling are being elaborated in an own-initiative report. These advanced technologies are meant to inform the drivers of the weather conditions such fog, rain, snow and temperature and of the flow of traffic; they are considered essential for the minimisation of road accidents and safer driving. Although recently cycles with horizontal position, to protect against spinal damage, is a note-worthy development.

Vd. Rail transport

39. Rail transport, if seen in its context of the new generation of trains, presents a competitive mode of transport of the year 2000. This competitive advantage is mainly the result of the factors that influence a passenger's choice:

i) high population density,

ii) linking of cities with developed local transit systems,

iii) strong reason to travel between cities because one city is a dominant centre of commercial, cultural or governmental activity

40. Looking at the future, two technologies are available: high-speed rail and magnetic levitation. High-speed trains are currently in use in France, Spain, Great Britain, Italy, Federal Republic of Germany and Japan and research on increased speed and safety is under way. However differences exist between the five protagonists not so much in the technological field but in the application of advanced technologies to meet the topography, demographic conditions and economic circumstances. The British design, for example, shares existing track with freight and commuter trains with maximum speed of 200 km/h. The French and Japanese have experimented with electrified engines and on new track reaching speeds of 210-270 km/h. Even at these speeds this type of technology is far more energy-efficient (consumming three times less than an aircraft) and is less harmful to the environment. The Germans and Italians have experimented with mixed passenger and freight traffic on new and existing track and electric power.

41. The prospects of magnetic levitation (maglev) technology which relies on magnetic suspension instead of conventional steel wheels on rail have become possible and present the future technological challenge. The Federal Republic of Germany has experimented with the attraction maglev technology which employs conventional iron-core electromagnets. Japan is developing the repulsion maglev technology which employs superconducting magnets.

    Both systems rely on electromagnetic forces to provide support (levitation), propulsion and braking without physical contact between the vehicle and the guideway. Both systems are designed to make trains run at 350-400 km/h.

42. The tangible and intangible benefits of such technologies range from the increased transport capacity, reduced congestion in highway and airport, environmental gains, energy efficiency, economic development, higher employment and safety to Community preference.

Ve. Sea transport

43. In the Commission's communication to the Council regarding its memorandum on maritime transport (COM(85)90 final), it is stated that the Commission is working on research proposals for new or improved technologies and that "this (programme) could be oriented along the following lines:

- maritime system (transport needs, new means of transport, ship-harbour interface),
- ship economy and competitivity,
- ship safety and environmental protection".(p.58)

The rapporteur could not only support such a programme but it would encourage research in alternative energy sources, such as wind-power, greater specialisation and rationalization of cargo-handling techniques.

44. It is of equal importance that technological and organizational innovation should be encouraged in the container field and in particular the intermodel traffic and combined traffic.

45. It is important to improve maritime communications upon which future developments in maritime transport would be based. Current research into mobile aeronautical communications via satellite should be encouraged.

The satellite system comprises three elements: the satellites, the coast-earth stations and ship-earth stations. The link between ships at sea and the terrestrial communications networks are provided by these three elements. The function of the satellite is to relay signals between ship-earth stations and coast-earth stations and in this manner they provide a global coverage. The advantages range from high reliability to complete privacy.

Vf. Air transport

46. Research into advanced air transport technology has concentrated on subsonic and supersonic aircraft. This is justified on the existing potential for a guadrupling of passenger-miles and for a doubling of airline route miles over the next 30 years. Technological advances therefore are expected to improve aircraft productivity via lighter materials, fuel-efficient engines and increases in size.

47. Given the great uncertainty about future price and availability of fuel, examination of alternative fuels such as synthetics or liquid hydrogen or methane should receive Community assistance.

48. The diminishing public tolerance towards noise in the vicinity of airports, a generic programme of R and D should be adopted. For example, the Concorde represents a proven technology which can be operated safely from existing airports. But its major deficiency is noise. This generic programme of R and D should concentrate on

- variations of propulsion technologies,
- airframe technology,
- aircraft technology.

49. In the field of airport infrastructure, the electronic apparatus currently used in military aviation (micro-computers, radars, antennas and beacons) should be adopted in the civil aviation. Guided aircraft, when visibility is not good, should become the rule not the exception.

50. As regards the security control mechanism installed at airports, future research should concentrate on improving existing technology; for example the three-dimensional X-ray scanners and detectors could spot easily plastic explosives and pick out suspicious bottles and weapons; this, of course, prosupposes that all checked luggage is X-rayed. Installing video cameras in airports would ensure greater security. Transit passengers and luggage would be double-checked.

Airport security will be further tightened, if recently developed advanced technology in the field of X-rays is used to detect the contents of containers. Analysing the mixture of the air of containers or luggage, if explosives or weapons are detected, the warning lights would be set on.

Vg. Pipelines[10]

51. The Committee on Transport intends to draw up a report on the socio-economic viability of pipelines as an alternative means of transport in the very near future. Its interest is mainly based upon the advantages pipelines offer to:

a) the transport of basic industrial products and raw materials in the form of gases, liquids and solids (slurry) at a cost that classic long-distance transport can no longer provide;

b) advancing the technological know-how and discoveries since the system components of pipelines (such as pump stations, test loops and communications facilities) present a new technology in the field of transport; hence the technical externalities that could make use of pipelines cannot yet be quantified.

c) the ecological aspect of a transport system which not only contributes to the environmental equilibrium but also promotes and preserves ecological balance;

d) the regional development and integration of peripheral regions of the Community characterised by underdeveloped systems of transportation and communications with the more central, well-developed regions of Europe;

e) the decentralisation and diversification of existing transport modes that, due to high and expected higher demand are used, to full capacity;

f) the promotion of employment in peripheral regions where the industrial products and raw materials are found yet due to industrial decline such regions suffer from high unemployment.

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10 This section owns much to the writings of Mr PAPAGEORGES, Maitre de Conferences a l'Universite de Liege.

52. For all the above aspects and in particular its high productivity: number of tons of massive products per kilometer,pipelines merit a comprehensive study that the Commission ought to finance. The comparative advantage of pipelines, the tangible and intangible technological benefits and the cost of pipelines should constitute the base of such a study.

Vh. Telecommunications

53. Telecommunications, as a sector, is an example of contradictions in the Community. It is over-regulated or monopolised which is against the spirit of the Rome Treaty. It is costly to the extent that for some services companies, communications is already their second largest expense after staff costs. Each Member State has developed its own technically different system. Each Member State does its own R and D. Some operate on the basis of laws dating back to the last century, when the telephone was still a novelty. Discussions between national telecommunication authorities on common standards have made little visible progress.

54. As result of the above institutional constraints, research on advanced technologies has suffered. The rapporteur would insist on giving priority to the list of innovative efforts and projects included in his motion for a resolution. He would also encourage research on the following:

- the value added network services which provide transactional facilities such as electronic mail, ordering and billing;

- the integrated services digital networks which combine telephone calls and high-speed data to be carried on the same circuits;

- the digital radio system, called Ultraphone, which enables four conversations to take place at the same time on a simple ultra-high frequency radio.

Vi. Conclusion

55. It has been argued in this report that the technology factor has been the most effective determinant in the long history of Europe. Technological advances have:

a) created the favourable conditions for the three industrial revolutions,

b) determined the flows of trade which, in turn, influenced the mode of transport more suitable for its transportation

c) maintained the standard of living of nations, and

d) dissiminated scientific discoveries to man

The Community is facing a technological challenge to which it can respond effectively by summoning up its human and capital research markets, by increasing its technological independence and by developing its own endogenous potential. The Community can! Does the Council want?

European Communities

EUROPEAN PARLIAMENT

Working Documents

1984-1985

21 February 1985 DOCUMENT 2-1732/84

MOTION FOR A RESOLUTION

tabled by Mr ANASTASSOPOULOS

pursuant to Rule 47 of the Rules of Procedure

on the role and the use of advanced and new technologies in the field of transport

The European Parliament,

A. being aware of the important role that new and advanced technologies have played in this "man made world",

B. acknowledging the fact that new technologies and technological change are the major determinants of the evolution of transport; that is to say that the use and extent of the available technological know-how has determined the four distinct periods of transport development:

- the first period being characterised by sheer muscular force lasting until the 18th century,
- the second period unfolding up to the first half of the 19th century coinciding with the first industrialization era and characterised by the steam-engine and coal use,
- the third period lasting for a century, i.e. up to the first half of the 20th century, being typical of the division of labour and application of nuclear power and coinciding with the second industrialization era but characterised by improvements in the application of advanced technologies,
- the fourth period dating from the mid-20th century up to today and witnessing the adoption of electronics, computers, robots and space - technology in contemporary modes of transport with a view to develop new ones in the near future;

C. whereas the need to:

- rationalise the available time,
- balance the physical ecology,
- improve the quality of life, and
- minimise the cost of maintenance

have become more pressing today, and an understanding of both the causes and the consequences of technological change have become imperative,

D. noting that the dual task facing the Community - that is to say the highest unemployment rate since the Second World War and lowest competitive edge with respect to its exportables and main competitors in world markets - could be partly met by the introduction of new and advanced technologies in transport and communication,

E. having regard to the commitment of the Community to remain active in phasing out public subsidies of outdated modes of transport and to actively introduce new and advanced technologies that can take into account the environmental factor and economic use of electronics, computers e.t.c.

F. whereas the structural evolution of transport due to new and advanced technologies should be balanced with the social and cultural evolution of man,

G. considering the capacity of the Community to assimilate and the motivation to innovate in new modes of transport has historically been its comparative advantage,

1. Notes with regret that the Community has not followed the process of technological change of its major competitors which has resulted in its costly, outdated and uncompetitive systems of transport;

2. Believes that the forces shaping technological change are the prime movers of economic growth and are to a very large extent past investments in inventive activities but above all due to a consistent policy to promote innovation and consequently new technologies;

as regards rail transport

3. Points to the fact that since 1930 the speed of trains have remained almost unchanged; for example the steam-train of the line Paris-Liège in 1930 took 4 hours and today the electrified-train takes 3 hours and 40 minutes, an insignificant gain of 20 minutes;

4. Reminds the competent bodies of the Community and member states of the new developments in the field of railways such as the high-speed trains which can attain 360 km/h and, hence, this mode of transport remains the most competitive for distances under 600 km;

5. Believes that the adoption of magnetic levitation for very-high-speed trains would progressively introduce similar advanced technologies in related activities resulting in technological externalities and consequently in improved utilisation of time;

6. Remains convinced that introduction of the Berlin-system air-cushion trains (hovertrain) not only would set off a new interest in advanced technologies but also it would improve economic welfare and the allocation of resources;

as regards road transport

7. Points out that this sector ought to introduce the available advanced technologies to building new engines and consequently, exhaust pipes, which minimise air pollution, preserve the ecological balance and effect energy savings;

8. Calls for the introduction of recommended Community fuel standards for road vehicles, particularly passenger vehicles;

9. Encourages manufacturers to introduce computer actuated engine management systems as a means of automatic tuning and energy saving;

10. Urges the adoption of new techniques in signalling both the weather, fog, rain, snow etc. and the traffic flow;

as regards sea transport

11. Is of the opinion that in order to steer the Community shipping in a direction that at least it can maintain its dominant position in world trade, more emphasis on high technology is paramount; experimenting with unmanned robot-ships and carrying an emergency ship would give Community shipping a competitive edge on today's fiercely competitive shipping lanes;

12. Stresses the fact that fuel-efficient engines would not only reduce costs but they would increase competitiveness;

13. Recommends the introduction of highly specialised shipping for certain purpose-built to carry chemical products and considers it a first rate example of a new technology that would ensure safety and preserve the ecological factor;

14. Urges greater attention to energy saving techniques in shipping by replacing oil with, possibly, nuclear power stored safely;

as regards air transport

15. Observes that the new and advanced technology used by military aviation, such as electronics, micro-computers, automatic flight, guided aircraft departure when visibility is not good, should be the prime consideration of civil aviation;

16. Asks IATA to adopt the new technologies in seat reservation and coordination of flights so that full utilisation of the existing aircraft capacity be achieved;

17. Draws attention to the need that civil aviation could make greater use of aerodynamic fuselage and lighter airframes which both conserve energy;

as regards oilelines

18. Considers it as a mode of transport of specific products which embodies new and advanced technologies and which, as a result of it, has proved to be more competitive, energy efficient and a contributor to improved environment;

19. Regrets the fact that the Commission has not taken any interest in acting as a promoter of new technologies and their diffusion nor has it drawn up a programme of technological research which could become the pole of technological leadership;

20. Calls upon the Commission to initiate a comprehensive programme of research in new and advanced technologies suitable to meet the future requirements of transport and communications; the present state of technology in communications which makes possible to hold "teleconferences" merits attention;

21. Instructs its President to forward this resolution to the Council, the Commission and the Governments of the Member States.

European Communities

EUROPEAN PARLIAMENT

WORKING DOCUMENTS

English Edition 1985-86

26 April 1985 B SERIES DOCUMENT B 2-231/85

MOTION FOR A RESOLUTION

tabled by Mr RAFTERY

pursuant to Rule 47 of the Rules of Procedure

on intra-Community transport

The European Parliament,

A. whereas the introduction of the TGV high speed train in France has proved successful and has led to a reduction in the number of air travellers between Paris and Lyons,

B. whereas over the relatively short distances pertaining in Europe, rail travel has many advantages over travel by air, particularly regarding convenience and cost,

C. whereas the cost of air travel in Europe is already unacceptably high,

D. whereas by providing a viable alternative to cars major benefits could accrue to the environment,

1. Considers that the development of high speed railways in Europe should be treated as a priority;

2. Believes that such a development would not only be economically beneficial but would also be desirable in that it would improve the intra-Community mobility of the majority of our citizens;

3. Considers that private enterprise should be invited to play a role in this field;

4. Calls on the Commission and the Member States to make definite proposals as to how policy developments in this important area could be both coordinated and encouraged;

5. Instructs its President to forward this resolution to the Commission of the European Communities and the Member States.

OPINION

(Rule 101 of the Rules of Procedure)

of the Committee on Energy, Research and Technology

Draftsman: Mr BONACCINI

At its meeting of 22 March 1985, the Committee on Energy, Research and Technology appointed Mr BONACCINI draftsman.

At its meeting of 16 September 1985, the committee considered the draft opinion and adopted its conclusions unanimously.

The following took part in the vote: Mr Poniatowski, chairman; Mrs Sälzer, Mr Adam, Mr Seligman, vice-chairmen; Mr Bonaccini, draftsman; Mrs Bloch von Blottnitz, Mr Crouse (deputizing for Mr Estgen), Mr Ford (deputizing for Mr Schinzel), Mr Ippolito, Mr Kilby, Mr Kolokotronis, Mr Mallet, Mr Metten (deputizing for Mrs Lizin), Mr Münch, Mr Rinsche, Mr Turner and Mrs Viehoff.

I. INTRODUCTION

1. The valuable and complex motion for a resolution (PE 96.105) drawn up by Mr Anastassopoulos is in itself so thorough that consideration of it would merit a whole range of comments exceeding the more limited scope of our committee's task.

2. The resolution concentrates on the problem of phasing out outdated and expensive modes of transport and the need to 'actively introduce new and advanced technologies'. There can be no doubt that, in addition to other sectors, the EEC should also encourage the channelling of the results of basic research to the very important sector of transport, which plays a large part in the freedom of citizens. A significant factor in this sector has been the delays and failure to act also condemned recently by the Court of Justice in Luxembourg. Although a number of interesting experimental projects have been carried out in this field (some have been in progress for several years already) in various parts of the world involving new modes of transport (magnetic monorail trains, use of nuclear propulsion for civilian purposes, use of missiles, helicopters, large-scale gliders, etc.), the present state of research and the progress so far achieved would seem to indicate that, at least until the end of the present century, there are unlikely to be any significant changes in the field of mass transport. The major task which the Community could undertake (and this is clear from its budget) is encouraging or supporting the creation of better infrastructures and applying to conventional modes of transport the benefits of new technologies, particularly informatics, telematics, robotics and the use of new materials and systems.
With regard to the three possible types of action mentioned above, the Community should concentrate its efforts on those regions of the EEC which are most backward in this field.

3. By way of conclusion to this general introduction, it must be said that for obvious reasons connected with the scarcity resources, a more general initiative of the type advocated by the author of the motion for a resolution would seem to be out of the question

4. It would be more advisable instead to undertake more specific and limited projects (pilot projects as it were) in certain fields, together with a general commitment to the continual improvement and modernization of conventional modes of transport. An exception should be made for long distance communications technology, which is capable of considerably reducing transport requirements by the use of telematic processing.

5. In addition to the limited remarks set out below concerning individual modes of transport, it should also be pointed out that the benefits which can now be derived from technology and organization should be aimed at:

   (a) placing major emphasis in all cases on considerably improving the conditions of transport users, who are not properly catered for at present except by services offering a greater degree of luxury, which is often unecessary and very expensive;

   (b) reducing distances by cutting door-to-door travel times;

   (c) keeping fuel and electricity consumption to a minimum;

   (d) attempting to find the most appropriate use for each mode of transport, on the basis of a combination of the abovementioned criteria, the nature of the transport operation, the distance to be covered and the growing need to reduce the level of pollution in the form of emissions and noise produced by the various modes of transport.

6. In the medium term, the following courses of action should be pursued:

   - increasingly replacing mechanical with electronic instruments in order to improve reliability;

   - greater use of new materials and construction methods;

   - greater use of computerized and remote controlled processes in the organization of transport services.

II. RAIL TRANSPORT

7. In view of the considerable amount of ground which has been lost in various Member States in recent decades, the Community and the Member States will have to make great efforts if the aim of making rail transport more competitive is to be achieved. The large scale use of computerized and remote controlled processes should ensure fault tolerant systems and enormous savings should be made by the elimination of the difficulties caused by level crossings, without the need to build expensive underpasses or overpasses.

   The use of these systems of organization, is already at an advanced stage, as regards installations and signalling. Outstanding results will be possible in the construction of high-speed tracks and trains through the use of new materials and the application of technologies which are already used for air transport and for cars and coaches. Bimodal traction trains (electric or diesel) can offer considerable versatility in the use of materials, with substantial savings in running costs, and the reduction of fuel consumption and noise pollution must be given particular encouragement.

8. These are not futuristic ideas but concrete proposals which can immediately be introduced or studied and for which a general Community strategy is therefore required together with encouragement and support for specific initiatives. Metropolitan areas, which are beset with serious commuter travel problems, could benefit from a better organization of existing transport structures, instead of constantly planning new additions to the existing network which in most cases go no further than the planning stage, although naturally some new lines will have to be planned and introduced. Attention should be drawn, however, to the great benefits offered by overground rail links in cities with a number of different railway stations. Two outstanding examples of this in Italy are Rome and Milan. This modernization and improvement of structures could also provide an opportunity for useful exchanges of experience between the various Member States as well as great opportunities for opening up contracts in Europe and improving the internal market through the adoption of management procedures and regulations at European level, to enable transport companies to become more independent and improve the social service which they provide.

9. However, the field in which most conspicuous progress towards helping the user will be possible is the facility enabling the user to call up from his own home information, and reservation and ticketing services, thereby eliminating the time-wasting and tedious process of queueing at various offices and the vagaries of some of the telephone services already in use.

10. Freight transport: the methods used today in the various sectors and which could be generally introduced involve the use of containers, transfer of freight and the increasingly sophisticated organization of collection centres.

III. AIR TRANSPORT

11. Air travellers face the same problems as those mentioned in connection with rail travellers, although the problem of door-to-door transport is even more acute (it is absolutely useless to travel from Milan to Rome in 50-55 minutes if it then takes an hour-and-a-half to travel to the city centre by public transport and if travellers are required to check in at airports 50-60 minutes prior to departure).

12. A specific initiative is clearly required to encourage the major EEC airports to bring their standards of operation and security to the highest levels possible using the technology now available.

This is a field in which the Community could facilitate the changes and improvements necessary by means of its own system of loans, particularly if the preliminary procedures were concluded rapidly. No particularly revolutionary inventions are required, merely the application of highly innovative technology for take-off and landing, (microwave instruments), flight information, meteorology, aircraft control, reduction of engine noise and pollution, automatic pilot systems, etc. A particularly useful field of research could be the possible use of experience acquired during space flights in the field of civil aviation.

As in the case of rail and sea transport, simplification of customs procedures and the gradual elimination of the EEC's internal frontiers would go a long way towards improving freight transport services.

13. Organizational improvements would help the situation considerably and this must be brought to the attention of the companies responsible for managing airport structures (interconnections between the systems operated by the various companies and organization of communications systems).

IV. LAND TRANSPORT

14. With regard to the different types of road transport (cars, buses, coaches), various technologies can assist the study of the conditions under which this kind of transport operates and its various aspects, including viability, safety, durability, flexibility and reliability of security mechanisms.

New materials have already been introduced and others are planned by the end of the century, which will make the car an appreciably different instrument from the one we know at present.

The use of lasers in manufacturing, the preparation of these materials, the processes connected with advanced mechanization (assembly and construction) and other less current ones relating to the introduction of robots, will involve an enterprise whose scale and nature will make it imperative that the Coimmunity take an interest and encourage it to act.

V. SEA TRANSPORT

15. Here again cooperation must be encouraged to promote the designing of engines with lower levels of consumption and pollution, as well as a greater degree of automation, although this is already at an advanced stage.

A project for the development of hydrofoils could make good use of the considerable experience and encouraging results already achieved in Europe, and could be particularly valuable for a number of peripheral regions of the Community thus helping to provide effective support for the less-favoured regions (Scotland, Greek islands, Sicilian islands).

VI. CONCLUSIONS

(a) We must give priority to the implementation of projects to mobilize European industry and prepare the way for a new generation of means of transport and we must make continual improvements in existing systems, through the use of the new technologies which are now available or likely to become so in the future.

The system does not require far-reaching general changes, but rather continual development and adjustment.

Greater comfort for travellers, a reduction in costs, greater safety, less pollution and a sharp increase in the general productivity of the societies in which we live, are all feasible objectives in the short and medium term.

(b) The problems faced at present are mainly organizational, involving the changing and adapting of services, and informatics and telematics technology could be used to resolve these problems.

In Brussels, for example, improvements have been achieved with a great minimum of fuss but with outstanding results. In other words, it is a question of disseminating technological innovations to the various sectors of economic life.

It should be remembered that in the overall productivity equation, the best results are achieved through the organization factor rather than by capital and labour.

(c) We must ensure that certain special projects are carried out by encouraging cooperation between companies and by urging European countries to combine their efforts. These projects include: as regards the railways: high speed trains and tracks, information technologies in signalling and, locomotives and organization systems, the chief aim being to make rail transport safer; as regards air transport: improving ground equipment, radar signalling equipment and satellite technologies for improved air traffic control, and greater aircraft safety; improving road safety, mainly by the use of information and sign-posting systems on intercity and urban road networks; as regards sea transport: development of new systems, particularly dual systems (sail and diesel).

Special efforts must also be made to design new engines with lower pollution and noise levels, since new technologies offer greater scope for environmental protection, and any other means enabling energy savings to be made in the transport sector.

Finally, the Community must focus its efforts on those regions which have fallen furthest behind in the transport sector.

(d) Whilst a general research programme into means of transport does not appear vital at the present time, a general Community initiative would be desirable in the near future for studies and research into new modes of mass transport.