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REPORT FROM THE COMMISSION

# EURET PROGRAMME EVALUATION

# EUROPEAN RESEARCH ON TRANSPORT

# FINAL REPORT

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**Evaluation report of the Commission concerning the specific programme for research and technological development in the field of transport**

The evaluation was carried out in conformity with article 4 § 2 of the Council Decision of 21.12.1990 which adopted the specific programme for research and technological development in the field of transport (EURET) (91/11/EEC) and in conformity with article 2 § 2 of the Council Decision adopting the Second Framework Programme of Community research and technological development (1987-1991) (87/516/Euratom, EEC).

The evaluation was carried out during one month in early 1995 by a panel of 5 external, independent experts and a rapporteur, appointed by the Commission.

The report is in general very positive. The Commission welcomes and takes note for example of the fact that the evaluators consider firstly that the approach adopted by the Commission with EURET, namely "to let EURET finance few and quite specific and well chosen projects has been a correct strategy" and secondly that "genuine R&D efforts under the auspices of EUROCONTROL and the Community of European Railways have greatly benefitted from co-operation with research teams and industry, and that the Commission's role has been essential."

In addition, the recognition that the selection of topics and the choice of contractors have been successful in terms of achieving the objectives set out for EURET in the Council decision is clearly important.

Due to the extension of much of the work carried out within EURET to the end of 1994, the final report has been written following the adoption of the Transport RTD Specific Programme (part of the Fourth Framework Programme). Nevertheless, many of the recommendations have already been taken up or will be reflected in the future elaboration and implementation of the Transport RTD Programme.

**General Comments**

In particular, the view of the panel that it is important to go " further, in the forthcoming phase and validate results, build demonstrators and test equipment", has been reflected by the emphasis placed on demonstration, not only in the Transport RTD programme, but also in other areas of Transport related RTD research financed by the Community such as the transport content of the Telematics Applications Programme. and the Non-Nuclear Energy Programme. These demonstrations will cover all areas of the transport system.

The necessity to "continue and extend cooperation with other organisations such as EUROCONTROL and the Community of European Railways" has also been clearly recognised. Such organisations have been involved in the process which lead to the

establishment of the Work Programme for the Transport RTD programme, and will continue to be involved during the life of the programme.

The Commission has clearly recognised the need to take "proper steps" to ensure the coordination of EC research and technological demonstration activities. A specific scheme of Interprogramme coordination has been set up to guarantee the complementarity and coherence of the different projects in the related specific programmes and arrange coordination with other RTD activities carried out in this area (eg by Member States and other international organisations), ensuring, where appropriate, improved interaction with activities carried out in other frameworks such as EUREKA and COST.

The necessity for the Commission to "exert its leadership with respect to national, bilateral or multi-lateral RTD programmes on transport in Europe" is also highlighted in the report. A series of Task Forces covering key transport related issues have been set up. The task forces aim to bring together Community, national and all relevant efforts in common RTD projects of industrial interest. The output of these common projects should be tangible results supported by industry which are in line with objectives of the relevant Community Policies and which build upon the work begun in the context of the EU RTD Programmes.

The contribution of the EURET Programme to the economic and social cohesion in the EU, though not directly addressed in the report, may be considered as positive, in terms of the spin-offs. The evaluators considered that the research has an important contribution to make with "regard to harmonisation, technical standards, safety requirements and upgrading of best practice for individual operators" and all of these results will by their very nature have a positive impact on the economic and social cohesion of the European Union, as well as contributing to an overall improvement in the competitiveness of the European Transport Industry. One of the key elements of the Transport RTD Programme is an assessment of the impact of the Trans European Networks, and in addition particular regard has been given to developing mechanisms for addressing problems of transport access to the peripheral regions of the Community. Both of these key areas of research will make an important contribution to improving the economic and social cohesion of the Community.

The report did not unfortunately consider why three concerted actions were abandoned in 1993. This would have been useful in order to learn from the experience and avoid a similar situation with Concerted Actions in the Fourth Framework Programme. Nevertheless, the Commission as a result of this experience, has adopted a different approach for the Concerted Actions which will be launched in the Transport RTD Programme. Member State support and participation for all proposed Concerted Actions have been and will be actively sought through the Programme Committee and it is hoped that this will guarantee the commitment of Member States to any Concerted Actions which are initiated.

It is important also to note that although the evaluation team did not consider

directly the Commission's management of the EURET programme, this had been considered in some detail in the mid-term review. The comments at that point in time included the necessity to "add the experience of international project management as a criterium to any future selection procedure" and the need to "ensure that co-operation between units that have previously worked in isolation be improved." Both of these issues have been addressed in the implementation of the Fourth Framework Programme. In addition, in the elaboration of the new Transport RTD Programme, the Commission has actively involved the Programme Committee in all stages. It is the Commission's intention that this approach should continue as the Programme develops. In addition, midway through the life of the Fourth Framework Programme it may be appropriate to launch an assessment which specifically addresses this issue of management in detail.

**Specific Comments**

The necessity of further research on control/command of high speed trains is also clearly reflected by the fact that around 70% of the budget available in the rail part of the Transport RTD Programme, will be dedicated to a continuation of the work in this area.

The importance of Combined Transport has been clearly recognised by the Commission. The Integrated Transport Chains.and Urban Transport sectors within the Transport RTD Programme will consider combined transport from the perspective of goods and passengers respectively. In addition, appropriate links will be established with the transport sector of the Telematics Applications Programme, which will consider the use of telematics as a means to promote intermodality and combined transport. Furthermore, the Commission has been and will be insisting upon the necessity that all technological developments in each individual transport sector take account of the necessity of "intermodality" and integrate an intermodal approach.

# Executive summary

## Introduction

This report analyses the results of the EC research programme for transport, EURET, which was launched in 1991 under the 2nd Framework Programme for RTD. In total EURET has granted ECU 26.8 million to 10 research projects, which were completed in 1994.

The evaluation was carried out during one month in early 1995 by a Panel of 5 external, independent experts and a rapporteur appointed by the Diectorate-General VII, Transport, of the European Commission.

The final reports from the projects have been studied and interviews held with Commission staff, project leaders and representatives from user organisations. The assessment takes into account that EURET is the first research programme directly linked to the Common Transport Policy and that a new larger programme is being launched under the 4th Framework Programme for RTD.

The EC Framework Programmes for RTD support a wide range of research topics of relevance for the transport sector and, in terms of resources, EURET has been a small component compared to programmes for advanced technologies in aviation and automotive transport, for example.

### Objectives, structure of work

The overall objectives of EURET, which aim at the harmonisation and integration of European Union transport R&D, are related to: 1) optimum transport network exploitation, 2) logistics and 3) reduction of harmful external effects, and the selected projects fall within the areas of air, rail, maritime, multi-modal and road transport.

The consortia who carried out the research comprised industry, research institutes and national authorities as well international bodies where such exist. The projects were managed by one lead partner in each consortium and monitored by the Commission services (DG VII). The work was in most cases divided into sub-tasks dealing with the definition and specification of user requirement, the design of new models, simulation and/or demonstration models, but prototypes, full scale tests or implementation were all beyond the scope of EURET. In many cases a considerable data collection and model building effort was made.

## Findings

The Panel note that because of limited funds EURET could focus on only a part of transport related research needs and agree with the strategy of financing 10 specific projects which the Panel consider well chosen.

In areas where there are well established counterparts at national and international level to represent users of transport research and where the industry of equipment producers is fairly concentrated, which is the case for air and rail, EURET has achieved

the involvement of those main players. Genuine European R&D efforts under the auspices of EUROCONTROL and the Community of European Railways (ERRI and A200) have greatly benefited from the co-operation with research teams from universities and industry. The Commission's role has been essential to this start which the Panel find particularly urgent for the research needed on command and control systems in high speed trains.

For maritime transport the Panel note the implications that EURET research may have on future standards for safety and the protection of sensitive marine environments. The Panel support the point made in some of the projects on maritime and inter-modal transport, which is that also existing, less high-tech solutions are relevant for the process of harmonisation and standard setting across Europe.

Finally, a very useful review of cost-benefit and multi-criteria analysis methods for decisions on infrastructure investments has been assembled and a common framework proposed.

## Recommendations

In summary, the Panel's recommendations for future EC transport research are:

- Since EC R&D on transport is spread among a number of Directorate-Generals and is financed under different programmes, proper steps must be taken by the Commission in order to aim at common, or at least coherent, objectives with respect to R&D policy and the Common Transport Policy.
- A clear priority should be given to those problems which most certainly fall under the competence of the Union and that only the EC can solve. Two such topics appear after the EURET evaluation, namely: research on control/command of high speed trains and research on the very complex problem of combined transport.
- EURET has produced preliminary studies, collection of data, system design or review of methods. The continuation of research should lead to demonstrators and equipment, where relevant. This is immediately possible within combined transport and maritime transport. It will be needed soon for air traffic control and rail systems.
- 'Stop and go' decisions or excessive delays should be avoided between initial research and continuing development phases.
- The Commission should continue and extend its co-operation with other organisations such as EUROCONTROL and the Community of European Railways and its research institute.

The Commission should exert its leadership with respect to national, bilateral or multi-lateral R&D programmes on transport in Europe by providing clear and effective directions and seeking association whenever possible.

# EURET PROGRAMME EVALUATION

## EUROPEAN RESEARCH ON TRANSPORT

## FINAL REPORT

| | | | |
|---|---|---|---|
| **Evaluation Committee:** | - | **Jean-Pierre Causse** | **Chairman** |
| | - | **Mogens Dahl** | **Rapporteur** |
| | - | **Arild Hervik** | |
| | - | **Emilio Martin Bauza** | |
| | - | **Tiago A.M. Ferreira** | |
| | - | **Wolfgang Gruno** | |
| **Commission DG VII:** | - | **E.M. Leonardi** | |
| | - | **J. Elias** | **Secretary** |

# Evaluation report of evaluation Committee

## 1 INTRODUCTION

### Background

This evaluation report is produced according to Art. 4.2 of the European Council's decision to launch a specific programme for transport research, **EURET**[1], with objectives related to competitiveness, safety and protection of the environment. Although embracing only a small number of R&D topics, the scope is the entire EC transport system. EURET is the first such programme of targeted R&D for the transport sector.

The European Commission's global **transport policy** emphasises **sustainable mobility** [2]. The means for a common European transport policy have taken shape with increasing speed during the last decade, witnessed by the legislation leading up to the opening of the internal market. The Commission increasingly has an active role and is in possession of a number of instruments. With the adoptions of the Single Act in 1986, the Maastricht Treaty and, most recently, with the decision by the European Council in Essen in December 1994 concerning Trans-European Networks, transport policy issues which require European level action have reached their current momentum.

**Research and development** projects have their role alongside other action lines on economic and regulatory frameworks, harmonisation, safety and environmental issues etc. EC R&D activities must find their orientation in that context whilst building upon the expertise of research organisations and industries in the Member States.

### Programme content

With the decision, in 1990, to launch **EURET** as a specific programme within the 2nd Framework Programme for Research and Technological Development ECU 25 million was made available for the 4-year period and a set of specific **objectives** were given. They are:

- Optimum transport network exploitation
- Logistics
- Reduction of harmful external effects

Later additions to the budget increased the total commitment under EURET to ECU 26.8 million.

The research within EURET was carried out between 1991 and 1994 and covered the following topics and projects:

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[1] Council decision of 21 December 1990 adopting a specific research and technological development programme in the field of transport (EURET) 1990 to 1993

[2] Communication from the Commission: "The future development of a common transport policy", COM(92) 494, 2 December 1992

| EURET, a specific research and technology programme in the field of transport 1990 to 1994<br>PROJECTS | | ECU 1.000 | Percent |
|---|---|---|---|
| *Air transport* | | | *33* |
| Trials in automated air/ground data exchange | AEGIS | 1.239 | |
| for air traffic management systems in Europe | EURATN | 3.434 | |
| Study on the controller working position in air traffic management systems in Europe | SWIFT | 2.998 | |
| *Rail transport* | | | *25* |
| European rail traffic managment system | ERTMS | 5.728 | |
| *Maritime transport* | | | *29* |
| Design and assessment of a vessel traffic | RTIS | 1.546 | |
| management system | TAIE | 1.278 | |
| Optimisation of manpower in maritime transport | ATOMOS | 2.992 | |
| Taking human factors into consideration in man/ship systems | MASIS | 918 | |
| *Multimodal transport* | | | *11* |
| Economic and technical research of the transfer of goods | SIMET | 2.576 | |
| *Concerted actions (road transport)* | | | *2* |
| Cost-benefit and multi-criteria analysis for new road construction - extended to other transport modes | | 528 | |
| All transport modes | 10 projects | 23.237 | *100* |

The launch and subsequent monitoring of EURET took place with the assistance of a committee of expert representatives from the Member States. A mid-term report was produced in December 1993.

The 9 projects and 1 concerted action (and 2 other concerted actions which were not completed) were selected among proposals submitted after the publication of a call for proposals in January 1991. The total support to shared-cost contracts and to concerted actions has been ECU 23.237.000, while expenditures reserved for the management and administrative costs amounted ECU 3.563.000.

The budget of EURET has been small by comparison to the overall R&D resources which were being devoted to transport related issues during the same period, at European as well as at national level. In fact, larger programmes are run by the European

Commission for research in aeronautics and automotive transport. The budget could add only marginally to the R&D requirements within the the transport services and equipment industry.

The Commission committed, in 1994, a further ECU 8 million to a number of smaller contracts which currently serve to assure continuity for some of the research work. These projects and others financed from outside EURET, though extending certain EURET projects, are not included in the above table and are not examined in this report.

For the coming years a new specific programme for transport R&D[3] has been adopted within the 4th Framework Programme for RTD[4] where also other programmes continue for aeronautics and transport related telematics and energy research. With a budget of ECU 240 million the new transport research programme will contribute to achieving the objectives of the Common Transport Policy. It is sub-divided into topics of which most have been taken up in EURET projects:

- Strategic research
- Rail transport
- Integrated transport chains
- Air transport
- Urban transport
- Waterborne transport
- Road transport

EURET is in close proximity to these actions for the development of a European transport policy and aligned with several other EU programmes; up to the point in time when this report was prepared, projects financed by EURET have been completed and the ground has been laid for future research.

## Evaluation objectives and methodology

The **Terms of Reference**[5] for the evaluation exercise are ambitious, a matter which is justified by the emerging importance of actions at European level for the transport infrastructure and its use. The Panel should therefore view EURET in the context of: research and policy and examine the results with regard to the specific objectives set for transport research at European level.

The **Panel Members** were appointed in January 1995 by the Commission (the Directorate-General VII, Transport) in their individual capacity and were not involved in programme before. They were given relevant documentation, including final reports from completed projects, the mid-term review, and the work programme for the new transport research programme; but visits to places where projects were executed were not possible. However, interviews were held with Commission staff, representatives from the lead partners of project consortia and a number of people representing user organisations of

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3 Council decision of 1 December 1994 adopting a specific research, technological development and demonstration programme in the field of transport 1994 to1998

4 4th Framework Programme for Community activities in the field of research, technological development and demonstration 1994 to 1998, adopted by the Council and the Parliament in 1994

5 See Appendix A

the research.[6]

The **rapporteur** and the **secretary** assisted the Panel in making material and people available during the two meetings held in Brussels in January and February 1995 and with the drafting of the report.

The **time frame for the evaluation** exercise was limited to one month, forcing the Panel to work quickly at the expense of in-depth analysis. Certain issues, for example relating to those proposals which did not succeed in being supported, the up-take of results in a wider context or the transfer of knowledge, were therefore not examined; this would have required more time than given to the Panel.

Under these circumstances the findings have their shortcomings and the wealth of information and experience gained by the many people who have taken an active part in the projects cannot be fully reflected.

[6] A list of people interviewed is given in Appendix D

# 2 AIR TRANSPORT

Because of budget constraints, only the most important part which is Air Traffic Management (ATM) has been covered within the air transport domain.

## AEGIS - ATM European Group for Improvement of Scenarios

| | | | |
|---|---|---|---|
| Contract n° 8101-CT91-1401 | | Proposal n° PL 910009 | |
| Total Cost | : 2.25 MECU | EC Contributions | : 1.23 MECU |
| Duration | : 27 months | Starting date | : Feb 92 |
| Coordinator | : Ingeniería de Sistemas para la Defensa de España (E) | Contact Person | : Mrs Santamaria |
| | | Phone | : +34.1.56.33.702 |

Partners: Sextant avionique (F), BNR Europe Ltd (UK), Syseca (F) and Univ. of London (UK).

### Objective, structure of work

Within the AEGIS project, attention has been paid to future ATM scenarios for European applications. In order to harmonise and integrate the different national, European and international ATM Scenarios, the requirements and constraints for a common European ATM have been analysed to meet anticipated traffic demand with the existing safety standards and at an affordable price. Because of the aforementioned reasons, the AEGIS project was created as a contribution to PHARE (Program for Harmonised ATM Research in EUROCONTROL) in order to ensure that ICAO standards and the most urgent requirements of EUROCONTROL member states will be met in an optimised way also taking into consideration the interest of service users, providers and industry.

### Results

The three phases of AEGIS

- assessment of existing ATM-related scenarios
- improvement of environmental, organisational and technical aspects
- cost benefit analysis

have been carried out by a competent consortium. The work was performed by the development of different methodologies and the result is that a reasonable and realistic ideal AEGIS-scenario which is the Generic Integrated ATM and Network Scenario

(GIANTS) has been developed. GIANTS will solve most current problems in the field of ATM as identified by users and will be provided to PHARE as a very satisfactory basis for ongoing activities and, in addition, as a contribution to the definition of the European Air Traffic Management System (EATMS) within the European ATC Harmonisation and Integration Program (EATCHIP). GIANTS also defines the tasks to be performed by the operators and the tools needed for this task proposing at the same time new types of responsibility-sharing. The results also made significant progress on the subject of cost-benefit analysis of ATM systems.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

AEGIS consortium is a multi-disciplinary group consisting of industrial institutions, industry, academics and airlines, also involving EUROCONTROL. The AEGIS approach indicated a balanced work between air and ground aspects, operational and technical considerations, and the wide spread of participants also covering the interest of service users, providers and industry. By joint financing, the cost-benefit factor is high for a study of this nature done by such a consortium and will ensure good effectiveness and competitiveness, which are also of general interest for the EU.

***Technological relevance (risk, safety, environment, validation)***

AEGIS has provided a good concept for scenarios of common interest with high flexibility and a complete description of the various aspects which are of particular importance for a safety critical environment like air transport. It can also be used as a good basis for experiments and validation work.

***Research relevance (co-operation, transfer of knowledge and applicability)***

The fact that requirements are not the same in different parts of Europe necessitates geographical phasing. In terms of European ATM harmonisation and integration, the consensus between all partners concerned is remarkable and is in this case a prerequisite for ongoing activities at all levels at the same time ensuring global improvement and consistency. The comparison of scenarios on the basis of advantages and limitations will also result in the establishment of quality standards for scenario evaluation and validation.

The final result of the AEGIS project seems to be a feasible system with perceived gains several times larger than their costs.

***EU relevance (R&D policies, transport policies and regulations and industry policies)***

The delays in air traffic which are caused by constraints in the present ATM system contribute to the political pressure for ATM reforms.

The AEGIS project supports the common initiatives at national and European levels. It is a good basis for supporting continuation or additional programmes within the foreseen 4th Framework Programme. Those studies could also serve as a good driving factor and at least in some cases as important starting points for the enhancement of the integration and harmonisation within the European community.

## EURATN - European Aeronautical Telecommunication Network

| | |
|---|---|
| Contract n° 8101-CT91-1402 | Proposal n° PL 910034 |
| Total Cost : 6.6 MECU | EC Contributions : 3.4 MECU |
| Duration : 33 months | Starting date : Feb 92 |
| Co-ordinator : Sofreavia (F) | Contact Person : Mr F. Colliver |
| | Phone : +33.66.25.95.73 |

Partners: Cap Gemini international Support (F), Electronik System Gesellschaft Mbh (D), Thomson-CSF/SDC (F), Société Internationale de Télécommunications Aéronautiques (F), Ingenieria de Sistemas para la Defensa de España (E), Stichting Nationaal Lucht- en Ruimtevaartlaboratorium (NL) and Logiciel pour l'informatique répartie (F).

## Objective, structure of work

ATN as designated by ICAO allows fixed (ground-ground) and mobile (ground-aircraft) data communication on a world-wide basis between air traffic services authorities, airlines and aircraft.

The EURATN project is beside AEGIS the second most important part of ATM. It was initiated to contribute to the validation of ATN standards. In order to perform ATN related experiments in the ATN environment, the planned result of this project was a fully deployed experimental ATN with detailed specifications of a test programme, interfaces to ATN-integrated sub-networks and relevant ATN applications.

Major tasks have been the development and procurement of ATN components, software components, network management standards and related tools, the evaluation of performances of EURATN system elements, validation tests and the definition of a EURATN Operations Manual.

## Results

The EURATN was foreseen to be used as a basis for the PHARE ATN and the EUROCONTROL Experimental ATN. The Consortium consisted of 8 main contractors and 4 subcontractors; however, because of some recognised problems in the course of the project, EUROCONTROL proposed some modification to the EURATN project which

resulted in the definition of a revised contract. The modifications consisted in studies for the contribution from EURATN to the European ATN Validation Plan and of the integration of EUROCONTROL routers as well as the addition of improved quality assurance procedures.

As a result, this prototype ATN network can now be used by EUROCONTROL and its member states' administrations to support ATN standards validation and will be further deployed into all PHARE research establishment sites to form the PHARE ATN Network.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

This project has increased the understanding of ATN amongst national administrations and industry. The result from the EURATN project was of such interest for EUROCONTROL that they have placed a further 2 MECU contract with the consortium.

***Technological relevance (risk, safety, environment, validation)***

Through the involvement of EUROCONTROL, risk reduction was reached by refinement of the program and especially by additional requirements for quality assurance provisions. In order to take care of the interest of EUROCONTROL member states, it was very helpful to have the research activities guided under the umbrella of EUROCONTROL. This helped diminishing duplication of efforts. The completion of this project resulted in a significant milestone for the development of ATN in Europe.

***Research relevance (co-operation, transfer of knowledge and applicability)***

The involvement of EUROCONTROL was beneficial in order to expedite the transfer of results to the administrations which will have to test the ATN and eventually implement it. The project co-financed by the Commission and the consortium, to whom EUROCONTROL provided further funds by means of the additional contract, is a good example of how the European Union and EUROCONTROL can co-fund R&D activities in the field of ATM.

***EU relevance (R&D policies, transport policies and regulations, and industry policies)***

From a political point of view, the reason for the Commission's involvement was that national systems to some extent could not provide enough flexibility (e.g., air space capacity); hence any progress in harmonisation and integration would be beneficial for European air transport. With reference to the needs for safety, cost-effectiveness and environmental aspects the aimed substantial improvement should allow all air space users the maximum freedom of movement.

# SWIFT - Specification for Working Positions in Future Air Traffic Control

| | |
|---|---|
| Contract n° 8101-CT91-1501 | Proposal n° PL 910002 |
| Total Cost : 5.8 | EC Contributions : 3.0 MECU |
| Duration : 34 months | Starting date : Mar 92 |
| Co-ordinator : Thomson-CSF/SDS (F) | Contact Person : Mr Amar |
| | Phone : +33.1.40.84.19.26 |

Partners: Instituto de Engenharia de Systemas e Computadores (P). Computer Applied Techniques Ltd (UK).
Univ. of the Aegean (GR). Siemens Plessey Electronic System Ltd (UK). Roke Manor Research Ltd (UK). Elektronik-System-GMBH (D). Stichting Nationaal Lucht- en Ruimtevaartlaboratorium (NL). Centre d'Etudes de la Navigation Aérienne (F) and Syseca (F)

## Objective, structure of work

The objective of SWIFT was to design the future Controllers Working Positions (CWP) by combining medium and long term operational evolutionary definition and technical studies resulting in the definition of specifications. The main tasks for the SWIFT project were performance requirements, operational concept, operational scenarios and their validation, human factor studies with specifications of human/computer interface and the SWIFT Demonstrator. The SWIFT work will be used as a contribution for EUROCONTROL to support PHARE and EATCHIP activities.

SWIFT will produce a set of validated scenarios taking into account the progressive enhancement of the ATM system for the time frame 1995-2015. The short term components have been given more weight at the beginning and, therefore, phase A (1995-2000) was done with priority and further work has been considered for phase B (2000-2015).

## Results

The aim of SWIFT was to provide detailed specifications of the CWP starting from common operational performance specifications. The work was performed by using operational and technical aspects of the CWP and at the same time taking into consideration the suitable Human Machine Interface. Detailed specifications for a control suite for phase A were produced taking into account system architecture requirements in order to meet the common operational needs applicable to the European context.

For experimental validation of scenarios, the involvement of controllers from operational units have been co-financed by EUROCONTROL and the Commission.

In addition to the final report, a SWIFT demonstrator (hardware and software integrated on a single workstation) has been developed and will be shown in the presence of the partners of the consortium; at airshows and at the EUROCONTROL Experimental Centre.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

The SWIFT consortium consisted of 10 partners from 7 Member States, including industry, research centres and universities. Five partners of the consortium were involved in the experimental trials of the scenario. Project management and results were homogeneous throughout the work of the various partners.

The advantages especially for industry are the availability of the definition for common guiding principles to be used for further development concerning the production of CWP's for European civil aviation authorities.

***Technological relevance (risk, safety, environment, validation)***

The ATC controllers involvement could not be included in the original contract for funding reasons. Therefore the non-availability of controllers at the beginning of the SWIFT project was a weak point because the controllers are really the concerned users. The extreme importance of analysing the first results with the concerned users was nevertheless recognised; the Commission and EUROCONTROL therefore found a way to co-finance some evaluation sessions with ATC controllers.

A suitable methodology for the description of human-machine interface specifications was defined which is important to ensure harmonisation. Human factors recommendations for the design of ATM applications were given.

***Research relevance (co-operation, transfer of knowledge and applicability)***

The SWIFT Demonstrator is a very helpful tool for the presentation of the results for further ATC research within EUROCONTROL and for the partners of the SWIFT consortium. This approach also supports transfer of knowledge between all partners involved.

The result of the evaluation process covered task allocation between the system and controllers, Datalink communications, strips replacement, use of working systems, information display and working aids.

***EU relevance (R&D policies, transport policies and regulations and industry policies)***

Within SWIFT, a high number of important tasks have been carried out which could have significant overlapping interest to other fields of air transport research. For that reason, it is helpful that the complete task reports are annexed to the SWIFT final report.

# 3 RAIL TRANSPORT

## ERTMS - European Rail Traffic Management System

| | | | |
|---|---|---|---|
| Contract n° 8101-CT91-1201 | | Proposal n° PL 910025 | |
| Total Cost | : 12 MECU | EC Contributions | : 5.7 MECU |
| Duration | : 30 months | Starting date | : 1 Feb 92 |
| Coordinator | : Siemens (D) | Contact Person | : Mr. Mandt |
| | | Phone | : +49.531.226.47.88 |

Partners: Ansaldo Transporti SpA (I), Compagnie de Signaux et d'Equipements Electroniques-Transport (F), GEC-Alsthom (GASA) SA (F) , EB Signal A/S (DK), Standard Electrik Lorenz AG(D), Westinghouse Brake and Signal LTD (UK); associated contractors: Ansaldo research (I), Sasib (I), Uni Genova (I), ACEC (B), ABB (SW), EB Ltd (UK), EB ABB (N), EB SENAL (ES), Dimetronic (ES)

## Objectives

The objective of this project is the study and the specification of an innovative new command control system for the railways[7]. Being first applied to high speed networks, it will be used later on existing lines, in order to increase the capacity for passengers and goods crossing the borders.

The system must be compatible with existing solutions adopted by the different national administrations where high speed trains are already running or are planned. Later on, it must progress to a new solution taking advantage of the evolution of the existing system and of new techniques, or of those already at the experimental stage in other and related fields.

ERTMS is an ambitious project dealing with difficulties from the technical point of view, on the one hand, and with concerns for regulatory procedures on the other hand. Only viewed as a whole can the project's success be determined.

ERTMS was carried out within the context of the first point of the 'specific objectives' of EURET, optimum transport exploitation. The first phase consisted only of the overall design of the system, the evaluation of the train location and communication tools, as well as of the development of major software components for the use of the system.

The European railways, as the users, had to deliver the functional requirements and overall system design specifications. This was done through the International Union of Railways (UIC), the Community of European Railways (CER), the European Rail Research Institute (ERRI) and the A200 Special Group within ERRI for questions related

[7] There are currently at least 13 different control command systems in service in Europe, which are not compatible with each other.

to ERTMS who also acted as advisers and technical consultant partners to the Commission and the project consortium.

Other topics, related to the research, were noted during the progress, and it was necessary to take them into account. This was achieved when new funds became available.

ERTMS is the only project developed for rail transport research and its total cost is the highest within EURET.

## Structure of work

In short, the project comprises four main tasks, each one divided into sub-tasks:

- System design
- Assessing train location tools
- Assessing transmission system
- Assessing data processing architecture

Also included under EURET, but started one year later, was a fifth task:

- EURORADIO (Equipment for the safe continuous transmission between trains and control centres, using a non-safe digital radio system)

Only the first Phase of EURORADIO was included in EURET based on the existing GSM (Global System for Mobile) covering the study and specification of structure. In accordance with the research progress, the availability of funds and in order to enhance the follow-up of the project, it was possible to initiate two more tasks: EUROCAB and EUROBALISE. EUROCAB deals with safe on-board equipment located in the driving engine. It integrates data received from the EUROBALISE with data read on board (distance, speed and time). EUROBALISE focuses on equipment for safe spot and semi-continuous transmission between the train and the track. These tasks, although related to the matters of ERTMS, were not financed by the project.

The consortium consisted of the main European signal and telecommunications industrial companies and some associated contractors, in total fifteen; thirteen were based in EU countries and two in non-EU countries.

## Results

The research done under ERTMS is fundamental to the implementation of the future Common Transport Policy for the railways, already started with harmonisation and interoperability.

For the railways it is equally important, since it facilitates the starting of new services without the need to stop at borders; it also increases security and competitiveness and reduces costs on new equipment for command control, owing to the widening of the market of future buyers, on a common standard.

Retrospectively, it would not have been possible to achieve the objectives of ERTMS without the Commission taking the lead.

Even if the full architecture of the system is not yet settled, the modular procedure adopted by the consortium allows for the evolution of compatibility between the existing systems and a future common solution, with later adoption of a common standard.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

The research already made on a common solution will reduce the diversity of products existing today in the market, with future benefits for industries, since they may focus on one product instead of spreading their resources over different ones.

The quality of the products can be increased, with lower costs because it has been taken into account from the beginning. Competitiveness between industries is assured since each one can present his own products, but always related to a common standard.

It must be stressed, however, that in order to take full profit of the research done and the production of a market product, the intervals between projects on a programme extending over several years as in the present case should be avoided, or at least reduced as much as possible;

The importance of this project may be felt not only in the internal market but also at the international market for rail equipment.

***Technological relevance (risk, safety, environment, validation)***

The safety of the new standard can be improved with direct benefits for both the industry and the railways and passengers.

Evolution of technologies is assured, leaving to the users the final choice of the best supplier.

Environmental aspects did not constitute a main item when the project was launched. However, negative impacts are not known up to now.

Tests have been started on the different parts of the available equipment but they need to be continued before full validation is accorded.

***Research relevance (co-operation, transfer of knowledge and applicability)***

Co-operation between partners seems to be good after initial difficulties, but must be improved on future work which may be supported by the next programme for transport research, in order to profit from the synergy already developed under ERTMS.

Transfer of technologies between partners is not reported but, since each one has to know and study solutions and existing products produced by the others, it is assumed that there has been a useful sharing of knowledge.

In terms of applicability, it seems too early to draw conclusions but it can be said that the work done so far has followed the guidelines of the main objectives.

***EU relevance (R&D policies, transport policies and regulations, industry policies)***

ERTMS has completed a first phase of research which is fundamental not only for a technical solution, but also for allowing the EC to progress to the following phases of setting the rules for the common rail traffic management system.

The extension of the high speed network is progressing faster than the availability of an optimal solution for new signalling and control equipment.

The lack of correct solutions for the performance of new, optimal equipment sufficiently tested and validated has the inherent danger that some national administrations chose to continue to invest in existing solutions and equipment. If this happens, the interest and opportunity to profit from ERTMS are strongly reduced, not to mention the negative impact on what concerns industry policies.

In view of this challenge, it is necessary to continue the ERTMS research with the highest priority and under a tight schedule.

# 4 MARITIME TRANSPORT

## RTIS - Regional Traffic Information Service

| | | | |
|---|---|---|---|
| Contract n° 8101-CT91-1301 | | Proposal n° PL 910026 | |
| Total Cost | : 2.59 MECU | EC Contributions | : 1.31 MECU |
| Duration | : 30 months | Starting date | : 1 Feb 92 |
| Coordinator | : Opeform sarl (F) | Contact Person | : Mr. C. Deutsch |
| | | Phone | : +33.1.46.57.62.10 |

Partners: Ditel (I), Cetemar SA (E), Marine Technology Development Company SA (GR), Marine Analytics (NL)

### Objectives

The overall objective is to improve the efficiency of the maritime transport by defining and developing an information system able both to enhance the safety of navigation and to optimise the interface between ships and shore-based infrastructures of shipping through the dissemination of real time information between the different agents involved.

The protection of the marine environment and the adjacent sensitive coastal zone is also a main objective.

The project in principle addresses the Mediterranean; it is intended that its main features could be transferable to other relevant maritime areas of the European Union.

### Structure of work

RTIS is subdivided into three phases:

- Review and assessment of the current situation
- System conception and design
- Project assessment

A total of 26 different tasks have been performed to complete all three phases. Seven Member States are represented through six research institutes (increased to nine later on), six small and medium-sized enterprises, one university and two industrial organisations.

### Results

Traffic statistics references have been established for the period 1989-91 on flows

of passengers and goods, movements of ships and cargo handling for the Mediterranean region.

A system which can serve users as a Value Added Network (VAN) by using the existing EDI (Electronic Data Interchange) transmission facilities may be implemented at very low cost.

A list has been established of more than thirty potential users, identified as primary users, allied services and other users, which may serve as a guide for further investigations.

An architecture has been developed comprising the design of links between nodes and between nodes and terminals.

A computerized demonstrator has been implemented and tested in a real network simulating various types of terminals (one coastal and one port VTS, nine port authority terminals and several co-operative ship terminals).

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

From the point of view of competitiveness the implementation of a Regional Traffic Information System could be useful by allowing the users who are managers of shipping companies, port installations and shippers to select more efficient maritime transport services. European ships would thus become more competitive than those not able to interact with the system. Producers of electronic computer equipment for maritime use could gain markets elsewhere in zones with similar traffic density. There could be advantages for fisheries and coastal tourism in terms of higher standards for safety and communication.

The system would also further the harmonisation of navigational procedures along European coasts and, perhaps more relevant, help to set educational standards and criteria for VTS operators.

***Technological relevance (risk, safety, environment, validation)***

Experience proves that VTS can reduce the risks of collisions and grounding in restricted areas such as port approaches and areas covered by traffic separation schemes. Several of RTIS findings which include specific description of functions and services could add to the value of existing systems.

***Research relevance (co-operation, transfer of knowledge and applicability)***

RTIS represents a new type of co-operation in this area by bringing teams together from seven Member States who would probably not otherwise have started joint work. The tasks of collecting data from data bases, questionnaire surveys and interviews do not in themselves imply transfer of knowledge to people outside the project. However, the

concept is fully applicable and a preliminary stage of it is currently being implemented in several Member States, with other EC funding.

***EU relevance (R&D policies, transport policies and regulations, industry policies)***

RTIS has contributed to the design of EC maritime safety policy as presented in the Commission's Communication to the Council and Parliament on "A Common Policy on Safe Seas" (Com (93) 66). It has supplied the system architecture to the Council's directive 93/75, 13 September 1993 concerning minimum requirements for vessels bound for or leaving EC ports and carrying dangerous or polluting goods. Undoubtedly, RTIS is relevant also for the "EUROREP" directive which is soon to be adopted

## TAIE - Tools to Assess Vessel Traffic Systems and to Increase the Efficiency of VTS

| | |
|---|---|
| Contract n° 8101-CT91-1302 | Proposal n° PL 910009 |
| Total Cost : 2.05 MECU | EC Contributions : 1.22 MECU |
| Duration : 30 months | Starting date : Feb 92 |
| Coordinator : Stichting Coördiinatie Maritiem Onderzoek | Contact Person : Mr. Flameling |
| | Phone : +31.10.413.09.60 |

Partners: Institut der Fachhochschule Hamburg. (D). BMT Fluid Mechanics Ltd (UK). Opeform (B)

## Objectives

This project has especially studied the interaction between vessel and shore-based VTS with a view to the development of tools which can improve the efficiency and safety of maritime traffic management in confined areas. The detailed topics covered include:

- Tools to assist in the design of efficient VTS
- The control of new shore-based pilotage, resource management and contingency planning
- Operational benefits through improved VTS procedures
- Enhanced maritime safety and environmental protection through better management base on detailed traffic and casualty data

It is the aim that results should be used in VTS and coastal areas in Europe and elsewhere.

## Structure of work

The entire project was sub-divided into 27 tasks which can be summarised as:

- Data collection on traffic casualties, casualties within VTS areas, etc.
- Development of scenarios on networks, hardware, data, cost, training, compatibility checks etc.
- Cost-benefit analysis tools, operational benefits and other related analysis tools

The project was performed by four partners and thirteen associated contractors from four Member States and one EFTA country. They included three big manufacturing companies, eight research institutes, three small and medium-sized companies and three universities.

## Results

The project has established a statistical traffic image of the North Sea covering movements of passenger and ro/ro ferries as well as other specified vessels. It has facilities for the prediction of future evolution in the traffic situation. This may be used as a tool to anticipate adverse conditions, to improve search and rescue operations and to reduce response times. In general the results can be used to assess Vessel Traffic Management and Information Systems with a view to increase efficiency and to provide safety and environmental data which may be integrated into regional systems.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

Maritime safety directly affects millions of passengers per year and the developed models are relevant for some of the most traffic congested areas in the World. The perspective is to step up the harmonisation of navigation procedures, the standardisation of messages and other procedures. Implementation would increase the capacity and thus the competitiveness of maritime passenger transport in those areas where other transport modes are direct alternatives.

***Technological relevance (risk, safety, environment, validation)***

A part of the new technology has been studied and an integrated vessel traffic management system shows the cost savings, safety and environmental benefits. In particular to assess the effects of safety measures tools have been developed including cost-benefit analysis, statistical traffic images and a proposed European casualty data base.

Technologically, the project is relevant for the marine electronic industry because it is very likely that congested traffic areas as well as inland waterways may develop systems of monitoring and assistance to navigation that would incorporate the findings of TAIE.

The environmental interest of this project is likely to be great since the protection of marine environment and wildlife is directly connected to the preventive measures that the tools permit to identify and assess.

***Research relevance (co-operation, transfer of knowledge and applicability)***

There seems to have been a fair amount of transfer of knowledge not only between the large number of partners and associated contractors, but also with the even more numerous participants in the RTIS project. The two projects differed in the geographical area studied but were otherwise directly connected. This positive interaction has probably led to taking a harmonised approach. Finally, part of the research has been of value to the competent international maritime bodies, namely the International Maritime Organisation and IALA (International Association of Lighthouse Authorities), who have used the results for resolutions, recommendations and manuals on VTS and VTMIS. In brief, the developed tools have proven to be practically applicable within existing VTS's.

***EU relevance (R&D policies, transport policies and regulations, industry policies)***

The political value of the project as one of the tools for policy making has been highlighted by the dramatic and recent passenger ship accidents, "Estonia" and "Achille Lauro" in 1994 and "Scandinavian Star" a few years earlier. The prompt political response to these and other accidents shows that guarantee of the protection of human life at sea is to be maintained with the highest possible standards.

## ATOMOS - Optimisation of Manpower in Maritime Transport Improvement of Competitiveness in community transport through implementing advanced technologies

Contract n° 8101-CT91-2301 Proposal n° PL 910015

Total Cost : 4.72 MECU EC Contributions : 2.54 MECU
Duration : 28 months Starting date : Feb 92
Coordinator : Danish State Railways (DK) Contact personact : Mr. Kasten
Phone : +45.42.86.36.80

Partners: National Technical University of Athens(GR), DMT Marinetechnik GmbH (D), Lloyds register (UK) Søren T. Lyngsø (DK)

## Objectives

With the aim of reducing the use of human effort on bridge and in engine room whilst maintaining safety standards, the technical objectives were to develop different parts of system control and to connect them into an Integrated Ship Control (ISC). Also main systems on board for navigation, manoeuvring, machinery control, maintenance and diagnostics should be integrated. A final objective was to assess the optimum crew composition and size for different types of ships

## Structure of work

The main research efforts fall in four categories:

- The establishment of base lines in the key areas of research
- The development of Integrated Ship Control and its applications
- Basic research into safety-related aspects
- Cost-benefit analysis of the results

ATOMOS originated from earlier design work in Denmark and Germany and comprises now five partners and four associated contractors from four Member States. Those are three big manufacturing companies, two research institutes, two small and medium-sized enterprises and two universities. The work is sub-divided into twelve main tasks.

## Results

Several systems have been developed related to the safety of ships:

- A decision support emergency management system for hull damage and fire on board situations
- A voyage and track planning system which optimises route selection by taking weather and sea conditions, ship propulsion, shipper requirements and other data into consideration
- A crew management system for the scheduling of training, education and certification of crew
- A maintenance system for engine rooms that optimises the life cycle of components and advises on required substitutions
- A diagnostic system for the identification of the cause of an alarm state into the ship's engine, thus enabling the crew to adopt curative procedures

Through the integration of these parts into one ship control system an important step has been made towards the definition of an international standard.

Finally, a personalised set-up integrating the main navigational instruments on the bridge has been constructed and demonstrated at professional exhibitions in 1994.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

Although sub-standard ships with low wage crew will always have lower costs, ATOMOS has shown that high-tech vessels would be more competitive than otherwise similar, but conventional, vessels with normal-sized crews, as well as being more reliable from the point of view of safety of navigation, safety of life and environmental risks. This

is of direct relevance for EU flagged ships which use higher qualified and more expensive crews.

European shipbuilding can benefit from the project, since the cost-benefit analysis induces shipowners to demand ships, or parts of ships such as bridge and engine room, which incorporate more economical technologies. Likewise, the marine equipment industry may benefit.

*Technological relevance (risk, safety, environment, validation)*

The systems have been validated through demonstration and are implemented onboard a commercial vessel in an experimental status. The innovative aspects are evident and the current operators express satisfaction.

The enhanced competitiveness and safety standards obtained by using these systems will have a positive environmental effect; notably the use of track planning and engine diagnostic systems will optimise fuel consumption and exhaust.

*Research relevance (co-operation, transfer of knowledge and applicability)*

The research which has been carried out in the broad areas of emergency, integration of systems, quality and control, impact measurements and ISC architecture is of relevance for ISC standards. Such standards are costly to develop but important in terms of safety by ensuring high performance under all conditions. Without research into better standards it is doubtful whether these systems will emerge in the desired number and quality.

*EU relevance (R&D policies, transport policies and regulations, industry policies)*

Targeted R&D into ISC systems have a potential for increasing the competitiveness of EU flagged ships by demonstrating the feasibility of raising and harmonising standards in Europe which, in turn, will give a strong incentive to implement high-tech systems and maintain a European fleet. ATOMOS has produced results in line with this general statement and has therefore a potential interest.

**MASIS - Human factors in Man/Ship system for the European Fleet**

| | | | |
|---|---|---|---|
| Contract n° 8101-CT91-2401 | | Proposal n° PL 910029 | |
| Total Cost | : 1.60 MECU | EC Contributions | : 0.84 MECU |
| Duration | : 26 months | Starting date | : Feb. 92 |
| Coordinator | : CETENA (I) | Contact Person | : Mr. D. Loggia |
| | | Phone | : +39.10.599.54.92 |

Partners: Cetemar SA (ES). Marconsult SpA (I). Institute of Shipping Economics and Logistics (D). University of Strathclyde. (UK). Hellenmat (GR)

## Objectives

Recognising that the 'human factor' contributes to 80% of all accidents it is the objective of MASIS:

- To analyse the professional behaviour of seafarers
- To find the basic origins of human errors in maritime transport
- To propose remedial actions which can improve safety and efficiency, reduce losses of lives and prevent accidents and ecological damage
- To perform the related cost-benefit analyses

## Structure of work

The project has been divided into 10 tasks covering the following main topics:

- Data collection from masters and shipowners
- Working and living conditions on various types of ships
- Crew behaviour with regard to duties and qualifications
- Feasibility of operating vessels with reduced crews
- Assessment of the negative effects of interference factors both external (noise, vibration, motions, etc.)
- Use of simulators for the evaluation of crew personal characteristics
- Remedial actions and cost-benefit analyses

The research was carried out by a consortium of six partners and six associated contractors from six Member States. The participants came from three research institutes, eight small and medium-sized enterprises and one university.

## Results

The analysis of data and information shows firstly that human factors play a key role in maritime safety and efficient ship operation, but levels of maritime education are very diverse across Europe. Secondly, operative efficiency can be improved in some on board procedures by better interfacing crew with automated systems. Thirdly, risk factors can be reduced by increasing practical training and renewal of equipment. Fourth, certain aspects of the on board environment such as noise, vibration, climate and severe motions can interfere with work efficiency. Finally, methods are suggested to enhance efficiency and accident prevention through better workload distribution.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

The proposed remedial actions, in particular the improvement of maritime education and training and the use of more reliable equipment and the improvement of comfort level though reduction of noise, vibrations, ship motions, etc., are of relevance to the competitiveness of the maritime industry.

*Technological relevance (risk, safety, environment, validation)*

Further research and development is needed into the combined effect of equipment renewal and higher education and training standards. The project has pointed out the importance of man/ship interaction for progress in safety, efficiency and marine environment protection. Standardisation of bridge layoút and workstation design is one possibility.

*Research relevance (co-operation, transfer of knowledge and applicability)*

MASIS has contributed to the co-operation and transfer of knowledge among the partners coming from research institutes, universities and industry. Application of results related to training are taking place through the present revision of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

*EU relevance (R&D policies, transport policies and regulations, industry policies)*

MASIS has contributed to EC maritime safety policies as presented in the Commission's Communication to the Council and Parliament on "A Common Policy on Safe Seas" (Com 92(23)). This relates to actions concerning the human element with emphasis on professional qualifications, the STCW convention and the IMO resolution A680 with recommendations on the "Safe Management Code".

The relevance for maintaining a competitive European flagged fleet is inherent in MASIS, as well as in the three above mentioned EURET projects. The continuously increasing standards of safety and working conditions will enhance the future competitive advantage of high standard European ships.

# 5 INTERMODAL TRANSPORT

## SIMET - Smart Inter-Modal European Transfer

Contract n° 8101-CT91-2201 Proposal n° PL 910027

Total Cost : 4.6MECU EC Contributions : 2.6 MECU
Duration : 32 months Starting date : Feb 92
Coordinator : Technicatome (F) Contact Person : Mr. Mercier-Handisyde
Phone : +33.1.69.33.83.76

Partners: Framatome (F), Centrale Recherche S.A. (F), Cotamasnaga Spa (I), European Advanced School of Logistics (IT), Universidad Politécnica de Madrid (ES), Dornier GmbH (D), Krupp Fordertechnik (D), Europe Combined Terminals (NL), NEA (NL), National Technical University of Athens (GR), Coherence S.C. (B)

## Objectives, structure of work

Intermodal transport (a broader concept than combined transport) has the attention of the Commission because it is seen as an alternative transport mode or technique that could absorb part of the increasing transport by road. Intermodal transport could stimulate the use of train transport infrastructure and waterborne transport. It has not yet acquired a sufficiently large share of total freight transport. SIMET is a contribution to the interoperability of transport infrastructures and transport means and equipment, with a view to a more efficient functioning of the entire transport system. The project on intermodal transport focuses on organisational, economic and technical research on the transfer of goods, and on the design and evaluation of rapid transfer systems. The build-up of SIMET research activities is done around the following main studies:

- Intermodal network organisation (good flow, transport networks, macro-model).
- Information systems (Electronic Data Interchange (EDI), Automatic Equipment Identification (AEI)).
- Present and future technologies (loading units, rolling stocks and transfer equipment).

The technical-economic study of ideal future terminals for intermodal transport including new smart technologies is developed from these three studies. The consortium consisted of twelve partners from seven different countries: four universities, four industrial companies (engineering and equipment), three research institutions and one transport operator. One of the industrial partners was project co-ordinator.

The objectives were to design and evaluate innovative and efficient systems of rapid loading and unloading of goods between different modes of transport, in particular railways. Making proposals for common standards and best technologies in specific conditions was an important objective. Thus SIMET should lead to a global proposal for common specifications able to connect yards in the Member States at the lowest possible cost.

## Results

An integrated, inter-regional European database of freight transport flows has been constructed. The main European infrastructure as a logical network covering all modes has been described in terms of the links between terminals in length, speed and sailing distances including link specification providing the data for a macro-model.

This model has firstly been used for the evaluation of the impact of traffic organisation and new, fast shipment technologies on intermodal transport in Europe. In particular, it allows the competitiveness of integrated transport flows to be assessed. Secondly, the model has been tested in the real case of the French-Spanish border and is also used in the EU-CH negotiations on transalpine traffic.

A third result is that there has been a further development of EDI (that has led to a process of standardisation) and an overview has been made covering AEI and the use of communication networks.

Fourth, a review of loading units and rolling stocks shows great diversity and, together with handling facilities, there is a strong need for co-ordination to stimulate intermodal transport. Some improvements of freight shipment equipment for the future have been explored on the basis of an inventory of the most promising current transfer technologies.

Finally, present and future terminals in Europe are classified. For the purpose of the establishment of specifications of all future terminals and for the technical-economic evaluation of their integration of new, smart technologies several micro-models have been developed.

## Assessment by relevant criteria

***Relevance for industry (competitiveness, harmonisation and costs)***

The goal of the research has been achieved and the process has shown the complexity of the subject. In the event that more rapid transfer of goods is achieved via intermodal transport, the transport cost for industry might decrease. The harmonisation of technologies might also give a market for European industry. The macro and micro-models could be of use for the calculation of cost reductions when changing equipment. It is of note that competing industries have been put together and they express their willingness to put forward new research proposals for the next programme; they have learned the limitation of a purely technical approach.

***Technological relevance (risk, safety, environment, validation)***

The review of different equipment and new technologies explores important areas for harmonisation and standardisation. Reduced environmental damage and fewer traffic accidents might occur in future. The main effort has been put in planning tools, several micro-models and a macro-model; the economic impact from different technologies could be analysed in these models.

Analysis of 'best technologies' has led to several "EURET TERMINAL" and simulation on this has been done, but for further work there is a need to test on a full scale pilot installation. This is expensive and not easy to finance because of market imperfections. During the project there was a change in focus from new "smart"

technology to their integrative aspects for practical solutions for existing transport equipment and this could be a useful experience for future technological research in combined transport under the next programme

***Research relevance (co-operation, transfer of knowledge and applicability)***

The macro-model would be a good decision-making tool for anybody considering to set up and develop terminals at regional level. Further research would be valuable. In the consortium competitors learned to work together and, as mentioned above, it is likely that research co-operation will continue in the form of a new proposal.

It is therefore needed to make a separate in-depth evaluation of the quality and potential use of the two models developed by SIMET in order to justify future input of resources.

***EU relevance (R&D policies, transport policies and regulations, industry policies)***

The databases and the macro-model could be an important tool for the implementation of a possibly forthcoming European master-plan for combined transport and terminals. The database and macro-model will also mean some help to the analysis of freight transport restrictions through Switzerland. These tools need to be kept up-dated. The harmonisation initiative that has been started on EDI and AEI requires more time but the experience so far is a necessary input in that process of negotiation between national authorities. Great diversity of loading equipment and rolling stocks leads to expensive transfer equipment and costly transfer operations and there is an obvious need to harmonise and standardise transfer equipment in relation to loading units. This is a task for the Commission to take on at EC level because individual Member States do not have sufficient incentive to stimulate the growth of combined transport. The approach of SIMET seems justified and a necessary start has been made for future research in the field of intermodal transport.

# 6 CONCERTED ACTIONS

**Concerted Action (and extension): Cost-benefit and multi-criteria analysis for new road construction and infrastructure investment in the field of railways, inland waterways, nodal centres for goods and passengers (Phase I - Inventory of methods)**

EC contribution: 528.000 ECU
Duration -: 60+12 months
Coordinator : Mr. E.M. Leonardi 5CEC)
Starting date : 1991
Contact Person : Prof. Tsamboulas
Phone : +30.1.77.80.559

Partners: Member States representatives
Consultants for support studies: Marcial & Echnique and Partners (UK), Unioversity of Leeds (UK)

## Objectives, structure of work

The study is a review of the state-of-the-art of cost-benefit and multi-criteria analysis for new road construction (and later extended to other modes). The work outlines the set of relevant impacts, which should be incorporated in the appraisal, and reviews the methods which can be used for valuing those impacts; finally, it examines the practical state-of-the-art of measurement and evaluation of impact variables. A proposed appraisal is set out and recommendations for further work are made.

The aim was to propose and develop in outline a common but flexible method of appraisal for new road construction (and extended in 1993). Potential users include regional and national authorities, the European Commission, the European Investment Bank and other sources of finance for transport infrastructures. The specific goal was to promote consistency of treatment of road projects across Member States, which would imply a degree of quality control and commonality at the forecasting stage as well as a common evaluation tool. The work has been conducted in four phases and has gathered inputs from Member States. The two consultants brought the findings together and the project was monitored by a Concertation Committee of representatives from the Member States who also provided information about appraisal methods used in their own countries.

## Results

EURET launched four concerted action but three were abandoned in 1993; the fourth was then able to extend the scope of cost-benefit analysis to include multi-modal transport. Reports were delivered on all other modes in 1994, thus completing the review of existing methods and criteria for all modes. The Concertation Committee has played an important co-ordination role in bringing together research work from different countries.

The final report recommends an approach for new road construction as a broad

framework consisting of mandatory impact variables with additional discretionary impact variables. This approach has been demonstrated in a computer-based model. It has not yet been used in field trials for road projects, but this would appear feasible.

## Assessment by relevant criteria

It is the aim of concerted actions to co-ordinate research, not to finance it. The co-ordination process is relevant for the Commission and it is important to focus on new R&D topics and to develop a tool for the decisions regarding transport policy. The objectives seem to have been achieved so far as a recommendation has been made for a common appraisal framework . The co-ordination appears to have been successful.

The topic has been well chosen because there is a need for better evaluation methods which better incorporate economic issues in the decision processes for infrastructure investment. The reports give a very good state-of-the-art analysis of all the important topics within cost-benefit analysis for all modes. The co-ordination work has been properly done.

The work has not produced new knowledge but has made existing methods more easily comparable and the proposed common framework for analysis within Member States is relevant for further EC initiatives. Such improvements of methods as are suggested represent a challenge for the Commission and the Concertation Committee, and both should give high priority to use the methods in decision processes.

In further work it would be a great challenge to stimulate EU countries to implement the framework. An important step to enhance this process would be taken by integrating this tool into main EU policy areas such as those proposed by the Christophersen group and in the context of the Structural Funds.

# 7 CONCLUSIONS

## General

The EURET programme has financed transport R&D with a total of ECU 23.236.632 divided between 9 'shared cost actions' and 1 'concerted action'. The projects have been carried out over a period of 3 years. The size and duration of the programme have thus limited EURET to focus on only a part of transport related research needs.

Within other R&D programmes at European level, notably those which are also specific programmes under the RTD Framework Programmes, much larger resources are being allocated. Notwithstanding the rationale and relevance of funding through a set of different procedures, the consequence is lesser transparency with respect to how, where and when transport R&D is financed via EC budgets.

Under those circumstances it has been a correct strategy to let EURET finance few and quite specific and well chosen projects. The topics are marked by their centrality to the Common Transport Policy and the application of common systems for the trans-European infrastructure.

A relatively high priority, in terms of funds allocated, has been given to air transport and rail transport. These are also the two areas where main players at national and international level are clearly identifiable and whose involvement must be assured in the design, execution and implementation of a sector-oriented R&D programmes such as EURET. In concrete terms EURET has initiated and given focus to the link between research policy and transport policy at EC level.

## Results

*Air transport* has received 33 % of EURET for three projects on different parts of **air traffic management systems**. This priority reflects the need for one European System with more capacity and compatible with ICAO norms In addition to technological results on a topic where there is an established international co-operation on advanced technologies, the projects have led in the right direction of positive synergy with EUROCONTROL and extended this organisation's research brief.

*Rail transport* has received 25 % for research which likewise focuses upon **rail traffic management systems** and here it is even more urgent to find solutions. On-going investment in high speed links across Europe cannot be held back, but EURET may have helped to shorten the lead time to a future single European command and control system. It is therefore good that EURET has helped to establish a ground for **co-operation among companies** which rank among the most important R&D performers in their respective fields. The existing **co-operation among national railways** has been supported by EURET to run a dedicated research facility (ERRI and A200), which is a positive development. The role of the Commission in rail transport has been essential in bringing such co-operation to a level which now shows good signs of achieving results.

*Maritime transport* has received 29% of EURET for four projects. As concentration is lacking in the sector itself, the challenges for European level R&D are different. International co-operation and conventions exist for maritime transport and the research has a bearing upon the standards for safety, for example. Notably the projects on

**traffic management** and **high-tech ship components** prove that a technology-push effect is relevant with regard to EC responsibilities for harmonisation, for direct regulations and for the transfer of best practices, even in situations where the best solutions are not necessarily those with the most high-tech equipment.

Also the project on *intermodal transport*, which accounts for 11%, has usefully focused on selected problems of **interoperability** with results which, when further developed, can be profitably exploited across Europe. By broadening its scope to include more traditional technologies the project has shown how difficult the subject is and how important it is to take initiatives at EC level. The building of models is a relevant input to decision-making involving national and local authorities.

*Road transport* research has been only marginally funded and has concentrated on **cost-benefit and multi-criteria analyses** producing an overview of existing methods. With subsequent extension to other transport modes as well, the proposed approach has yet to be tried out in the field. The modest EURET finance may be partly due to the fact that other EC programmes, such as DRIVE, give very large grants to road traffic research.

## Overall objectives

In terms of **achieving the objectives set out for EURET** in 1990 by the Council decision, both the selection of topics and the choice of contractors have been successful albeit time and financial resources were such that the projects and the programme as a whole can only be seen as a pilot for further R&D. The research results have shown that EC level co-operation on transport R&D has an important contribution to make towards the preparation of other elements of the Common Transport Policy, in particular with regard to harmonisation, technical standards, safety requirements and upgrading of best practice for individual operators.

Some EURET projects have carried design and specification studies forward to the demonstration phase, notably in the maritime and air transport areas. This is a necessary step for further transfer of knowledge and, of course, the visible impact upon environmental aspects, energy consumption and industrial competitiveness can only be expected later.

As regards the **effects of EURET upon EC policy for transport and transport related industrial policies** a main result has been to open up the perspectives offered by targeted R&D, which are now pursued under the 4th Framework Programme for RTD. However, EURET is only one of several EC actions for R&D of relevance for transport. The specific programme for transport research under the 4th Framework Programme for RTD will allow topics from EURET to be carried on at a much larger scale.

Finally, the **Commission's management of EURET**, being carried out by DG VII (Transport), has been supported by part of the EURET budget. This share, about 13%, seems excessive by usual standards. However, in view of the tasks involved during the launch and monitoring of a new programme, the proportion may be justified.

# RECOMMENDATIONS

Owing to the late date chosen by the Commission, Directorate-General VII, Transport, for this final evaluation of EURET, the recommendations from the Panel will have limited impact on the 4th Framework Programme for RTD, already approved and well under way. Nevertheless, the following recommendations are submitted with the hope that they will be helpful.

Firstly, since EC R&D on transport is spread among a number of Directorate-Generals and is financed under different programmes, proper steps must be taken by the Commission in order to aim at common, or at least coherent, objectives. An overall view of all actions in this field seems absolutely necessary; otherwise no authority will be able to assess, let alone to direct, the results of the R&D efforts with respect to the Common Transport Policy.

Secondly, already when contracts after the first calls for proposals under the 4th Framework Programme are awarded and in all later phases a clear priority should be given to those problems which fall most certainly within the competence of the Union and that only the EC can solve. Two such topics appear after the EURET evaluation:

- Research on control/command of high speed trains must lead, within the shortest possible time, to a new European system which no single Member State nor industrial company can be reasonably expected to develop to everybody's satisfaction.
- Research on the very complex problem of combined transport must be pursued at EC level in order to give the best chances of providing Europe with the benefits expected from this concept. Preliminary budgetary figures of the 4th Framework Programme, given for information only to the Panel, created some concern among its members that this topic is expected to be financially supported from several DGs with funds allocated to individual transport modes, thus further emphasising the need for stronger management and control.

Thirdly, R&D efforts consisted primarily of preliminary studies, collection of data, system design or review of methods and ended accordingly mostly with written reports. In the view of the Panel, it is important to go further, in the forthcoming phase, and validate these results, build demonstrators and test equipment where relevant. This has been shown for air traffic control and is immediately possible within combined transport and maritime transport. It will be needed soon for rail systems.

Fourth, 'stop and go' decisions or excessive delays should be avoided between initial research and continuing development phases. This should be facilitated by the pluri-annual nature of the 4th Framework Programme.

Fifth, the Commission should continue and extend its co-operation with other organisations such as EUROCONTROL and the Council of European Railways and its research institute.

Finally, the Commission should exert its leadership with respect to national, bilateral or multi-lateral R&D programmes on transport in Europe by providing clear and effective directions and seeking association whenever possible.

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