EUROPEAN COMMISSION
5TH R. & D. FRAMEWORK PROGRAMME
COMPETITIVE AND SUSTAINABLE GROWTH
(GROWTH) PROGRAMME

WORK PACKAGE 0
Final Management Report

Contract Number: 2000 - AC - 10927
Project acronym: IN.HO.TRA
Project full title: INTEROPERABLE INTERMODAL HORIZONTAL TRANSHIPMENT
Duration: 36 Month (extended to 42 month)

Project Co-ordinator: COSTAMASNAGA S.p.A. IT
successor: SGKV DE (01)
Contractors: R&D
SGKV Studiengesellschaft für
den kombinierten Verkehr e.V. DE (02)
EURETITALIA S.r.l. IT (03)
GUHA AG CH (04)
TECHNICATOME FR (05)
successor: cybernétix
INDUSTRIES
ADTRANZ DE (06)
successor: KombiConsult GmbH (R&D) DE
MANNESMANN REXROTH HU (07)
successor: Bosch Rexroth
RAIL CARGO AUSTRIA AT (08)
NEUWEILER AG CH (09)
CARCONTRAIN AB SE (10)
UNIVERSITIES
ETH ZÜRICH - IVT CH (11)
ARRC Ltd. UK (12)

Document Revision Date: 30. December 2003
Editor:
Dr. rer. pol. Christoph Seidelmann
Dipl.-Ing. Roland Frindik
Studiengesellschaft für den kombinierten Verkehr e.V. (SGKV)
Börsenplatz 1
60313 Frankfurt am Main
Germany
http://www.sgkv.de
FINAL MANAGEMENT REPORT ................................................................. 4
1 GENERAL BACKGROUND .................................................................. 4
2 VERTICAL AND HORIZONTAL TRANSFER SYSTEMS .................. 4
3 THE INHOTRA PROJECT STRUCTURE .............................................. 5
4 INVENTORY OF EXISTING SYSTEMS ............................................. 9
5 SEMI-TRAILERS IN HORIZONTAL TRANSFER ............................. 10
6 THE SWISS DEMONSTRATOR NETHS ........................................ 12
7 THE AUSTRIAN DEMONSTRATOR IUT ........................................ 13
8 THE HUNGARIAN DEMONSTRATOR RTS ................................. 14
9 SPECIFIC ADVANTAGES OF HORIZONTAL TRANSFER EQUIPMENT RECOMMENDED FOR FURTHER DEVELOPMENT AND REALISATION ........................................... 16
  9.1 TRANSFER UNDER CATENARIES ........................................... 16
  9.2 SELECTING TRANSFER .......................................................... 16
  9.3 COMMERCIAL OPERATION OF SMALL TERMINALS .......... 17
  9.4 COMMERCIAL OPERATION OF DOWNTOWN TRANSFER FACILITY .......... 17
10 STANDARDISATION AND TECHNICAL RULES ............................. 17
11 RESULTS OF WORK WITH THE ADVISORY BOARD .............. 18
  11.1 PURPOSE AND WORK OF THE ADVISORY BOARD ............ 18
  11.2 MEETINGS AND WORKSHOP WITH THE ADVISORY BOARD .......... 19
Final Management Report

1 General background

Intermodal transport did not develop at the speed as desired by politics in Europe. This led to various political initiatives in favour of intermodal transport, amongst other such in research and development of technical systems.

One basic problem of intermodal transport is the additional cost of the transfer. While unimodal transport can move from ramp to ramp, from ware-house to ware-house without intermediate transfer of goods or of loading units, intermodal transport necessarily includes 2 intermodal transfers. The additional costs of such transfers hamper the competitiveness of intermodal transport; they must be compensated by other advantages in cost or quality. The greater the costs of transfer, the more compensation is needed. So, research and development concentrate very much on cheap and efficient transfer systems in intermodal transport.

2 Vertical and horizontal transfer systems

European intermodal transport has ever used both systems of transfer, horizontal and vertical, and horizontal transhipment was the leading technique in the years before 1970. But, over the time period of systems development, the vertical transfer gained more and more momentum.

Horizontal transfer systems were mainly introduced in short sea shipping with Roll on/Roll off-transport. These techniques developed quickly in the time between 1965 and 2000 in the North Sea, the Baltic and the Mediterranean trade routes. Since the end of this millennium, we observe that more and more actors move on the longer trade routes from trailers in roll/roll off-transport to containers and swap bodies with vertical transfer. As the volume of European trade grows rapidly, some trade routes with very large volumes appear, and on such routes the container transport seems like is more efficient than the trailer and roll on/roll off-transport.

Similar developments can be observed in intermodal transport road/rail. Some countries introduced in the 1970s specific offers with railcars of the type Rollende Landstrasse (Rolling road, very low floor wagons for RoRo-transfer, Abbreviation: RoLa) with horizontal transfer of road trains and articulated road vehicles. These offers have only survived in specific markets, most of them with open of hidden subsidies incurred. Similarly, some special railcars to accommodate semi-trailers loaded in horizontal transfer (e. g. swivelling-pocket wagon in Germany, kangaroo wagon in France) have been abandoned.

Containers and swap bodies never had been transferred horizontally. Because of their uneven bottom surface, the conventional means of horizontal transfer such as conveyor belts or roller beds were not applicable. All suggestions in ISO Technical Committee 104 Freight containers and in CEN Technical Committee 119 Swap bodies for intermodal transport to consider flush bottom loading units had not been followed. Insofar, the trade and intermodal transport with box type loading units never applied horizontal transfer techniques in greater scale.

The economic discussion in intermodal transport road/rail came, over the recent years, in most countries to the result that techniques such as RoLa or carriage of complete trailers (possibly even with accommodation for drivers, so called accompanied intermodal transport) on intermodal transport trains was by far not as economic as the technique to transport boxes such as containers or swap bodies. A standard freight train circulating in Central European rail networks will carry some 80 boxes of 20 ft. or 7 m, i.e. the capacity of 40 full size road vehicles. A
train of RoLa-low floor wagons will carry some 18 – 24 road trains or articulated road vehicles, almost 50 % less. The costs for traction and for the slot use in rail network – two most important cost components in intermodal transport road/rail – are costs per train, irrespective how many loading units it carries. With other words: The techniques that use classic horizontal transfer in intermodal transport show, in some important cost components, costs per unit that are almost double as high as the systems that use vertical transport.

Incidentally, intermodal transport road/rail in North America developed at similar patterns. These transports started in the 1970s as trailer on flat car (TOFC) services: semi-trailers were driven via a circus ramp on freight trains composed of platform railcars. Since the 1980s, growth in intermodal transport shifted to another technique, the double stack trains. Containers were loaded in two layers high on flat car with wells between the bogies. This technique was called container of flat car (COFC) and created practically all the growth of intermodal transport in North America. The reason is similar to the European experience: Freight trains carrying boxes can carry rather double the quantity of cargo carrying units compared to the movement of semi-trailers or complete road vehicles.

While horizontal transfer decreased more and more in importance in intermodal transport, various technical systems using this technique were suggested by the European engineers. Partly these suggestions aimed at replacement of current vertical transfer system; partly they aimed at specific application and specific markets that were not served by intermodal transport up to date.

So, the political and commercial actors in Europe are confronted with the questions:

- Can European engineers conceive horizontal transfer systems for intermodal transport that allow a cheaper transfer between the modes of transport than the current technical systems?
- Can European engineers conceive horizontal transfer techniques that can serve purposes and markets that today cannot be served by intermodal transport?
- What are these specific purposes and markets?
- Are changes in standards, in technical rules and/or in legislation needed to ensure proper application of horizontal transfer techniques in intermodal transport?

To find the qualified response to these questions was the main scientific, but together with the demonstrators also a practical goal of the InHoTra Project.

3 The InHoTra project structure

The InHoTra project is conceived as a parallel and co-ordinated research activity on the one side, and a set of technical developments and related test operations (“demonstrators”) on the other side.

The research side covered mainly the following items:

- Creation of an overview on horizontal transfer system developed in Europe so far including a systematic evaluation of their specific technical details and their commercial life (if any);
• Creation of a systematic approach to the evaluation of horizontal transfer systems in intermodal transport, their technical aspects and their commercial background; this evaluation scheme is similarly applied to the overview on historically realised solutions and for the equipment to be developed in the course of the project;

• Technical and commercial evaluation of the equipment realised within the project, together with an analysis of target markets and comparison with competing techniques;

• Based on this evaluation, recommendations towards standardisation, harmonisation of European legislation and technical rules and other measures were established to create an environment for better use of horizontal transhipment in Europe.

• In addition, a specific part of the study must cover the problems concerning current transport containers and their possible horizontal transfer, and the problems and experience gained with the horizontal transfer of European semi-trailers between road and rail.

The demonstration side planned to promote the design, manufacturing and operation in real commercial life of 6 differing approaches to horizontal transhipment of intermodal loading units:

• The system CargoRoo with horizontal transfer of semi-trailers with special adapters on special terminals with side platforms using special railcars with onboard transfer machinery to be provided by a German railway technology group ADtranz,

artist view: loading of the special wagon

artist view: details of the caterpillar (two on each wagon) with centring pin
• the system CCT with horizontal transfer of existing standard containers and swap bodies on any even loading track / loading lane transfer point for transport on specific road and rail vehicles equipped with lifting pins provided by a Swedish technology company CarConTrain AB,

artist view: rail-road transfer

---

• the system TRAI 2000 for horizontal transfer of existing standard containers and swap bodies using special intermediate platforms under the intermodal loading unit to be transferred between special road and special rail vehicles on unique head-end terminals provided by the Italian railcar manufacturer Costamasnaga,

artist view: rail-road transfer.

artist view: storage-rail transfer.
• the horizontal transfer machine NETHS to handle existing standard containers and swap bodies between existing road and rail vehicles provided by the Swiss machine manufacturer Neuweiler in co-operation with Tuchschmid,

*artist view: one half of the NETHS machinery (other part symmetric)*

• the horizontal transfer machine to handle existing standard containers and swap bodies between existing road and rail vehicles with a vertical organised sorting and storage system IUT provided by an Austrian rail operator Rail Cargo Austria,

*artist view: three level storage and portal lifting machine IUT*
• the horizontal transfer machine RTS to handle existing standard containers and swap bodies between existing road and rail vehicles with a horizontal shifting and storage arrangement attached extendable with a vertical stacking lift provided by a Hungarian machine manufacturer Bosch Rexroth.

* drawing: possible arrangement of RTS reloader, stacking lift and shifting field*

The first three technology plans (German, Swedish and Italian systems provider) failed, partly for commercial reasons within the companies that had prepared the units, partly for more general reasons:

- Some technologies needed a totally new designed loading unit or a re-design of existing loading units. The commercial actors in intermodal transport refused to follow that idea.
- Some technologies suggest additional pieces of equipment (adapter) such as an intermediate platform between loading unit and transfer system. Commercial actors did not accept such ideas because the operation becomes too complicated.

The other three technical approaches were finalised, built and tested according to the common testing plans of InHoTra and evaluated by the research team.

4 Inventory of existing systems

The research team established an inventory of existing horizontal transfer systems planned and (partly) manufactured in Europe so far. As experts of various European countries composed the research team, this inventory could be organised as a Pan-European overview.

Basically this survey shows that very many technical solutions had been suggested in the past. It is interesting to note that with the majority of such suggestion, not even an economic evaluation had been undertaken. No wonder, that almost none of such suggestions reached the status of realisation and test.

Even those few technical solutions that had been realised as concrete transfer machines, most failed to gain commercial success. The main reason for this is the fact that combined transport in the recent years concentrated on the establishment of large scale operations such as block trains or large barges; such systems normally are better served by overhead cranes than by horizontal working equipment. Solutions that need an operation under catenaries – such type of operation almost necessarily depends on horizontal transfer technique - were not realised in commercial environment over the recent decades.
Summing up, we see that many solutions have already been invented – most of them more than once –, but never brought to a commercial success. That leads to a basic form of question for the techniques realised with in the InHoTra project: If we wish to realise commercially viable solutions in horizontal transfer, the engineer must put forward the question: What can this equipment do, what vertical operating equipment cannot do, or cannot do better? This question was found to be key element in all evaluations to come.

Some of the more important reasons for such lack of success are as follows:

- Some technologies needed a totally new designed loading unit or a re-design of existing loading units. The commercial actors in intermodal transport refused to follow that idea.

- Some technologies suggest additional pieces of equipment (adapter) such as an intermediate platform between loading unit and transfer system. Commercial actors did not accept such ideas because the operation becomes too complicated.

- Some technologies asked for specialised road rail vehicles. The investment in such vehicles would only make sense if the system was fully introduced and maintained throughout the depreciation period. Nobody can guarantee an economic success over many years, so the commercial actors hesitated to go for large-scale investments into such technologies. But at least some of these, mainly the RoadRailer, had been introduced on a commercial basis.

Finally we see that such horizontal transhipment technologies are most likely to succeed which are based on existing loading units and existing rolling stock. The project demonstrated this in a nutshell: Three concepts of horizontal shipments have been abandoned during the course of the project, all of them such technologies that requested special design in rolling stock and loading units. All techniques that remained and had been developed with live demonstration had been based on existing road and rail vehicles use, and on existing standard unit loads.

5 semi-trailers in horizontal transfer

Articulated road vehicles with semi-trailers today carry more than half of international road operation out. This is certainly a fascinating market potential.

Semi-trailers can be loaded on railcars either vertically (by means of crane or reach stacker lift) or horizontally (by driving on to the flat car over a circus ramp or on special wagons with lift able or turntable platforms). Vertical transfer needs some additional strength to be included in the construction of the road vehicle. Normally semi-trailers do not include these features. They would increase the costs by some 1000 € per unit, and most companies avoid to pay these extra costs. The percentage of semi-trailers prepared for vertical transfer compared to the total sale volume is 2 % in Germany. Insofar we must state that this alternative will only become popular if the Member States or the European Union offers to take over the cost difference to promote intermodal transport.

The other choice would be to come forward with a technique of railcar and road/rail transfer that allows for horizontal loading.

Such systems had been in operation, mainly in France and in Germany in the 1970s (system kangaroo, swivelling wagon), as well as in the USA (Trailer on Flat Car – TOFC), but all of
them have been abandoned meanwhile. Successful operation of trailers and truck trains on flat car is installed on broad gauge railway lines in Eastern Europe, as the loading gauge is much wider than the that one used on standard gauge in Central and Western Europe. Trains with operation of the mentioned type are running in Finland and between Poland and Ukraine.

New techniques are currently under consideration. This has been monitored by the InHoTra project. Only one commercially applied solution has is under way up to now, i. e. the Modalohr technique on the Alpine corridor between Italy and France.

![Modalohr system](image)

**Image: Modalohr system**

Seeing the extra-ordinary high market potential in intermodal transport of semi-trailers, it is recommended to foster the development of horizontal transfer techniques of semi-trailers and check the feasibility of those solutions that currently are brought into discussion. Another most important item will be a more detailed market assessment in this field. Whatever States or the European Commission might consider to do to promote the operation of semi-trailers in intermodal transport road/rail, a careful market analysis including a survey of structure of the road transport industry in various European States has to be established. At least, experts have to look how far the structure of road transport can be transferred easily into the specific patterns of intermodal transport road/rail. It is an absurd idea that Europe tries with many efforts to open intermodal transport to semi-trailers while the operators of these vehicles might show enterprise structures that widely hamper such a development.

As a kind of follow up of InHoTra a study comparing and evaluating the available technologies for horizontal transhipment of semi-trailers in Europe is on the way in Germany. It is managed by SGKV and is supported by the German Ministry for Education and Research (BMBF).
6 The Swiss demonstrator NETHS

The NETHS (Neuweiler Tuchschmid Horizontal System) has been developed by Neuweiler AG, Switzerland in close co-operation with Tuchschmid, Switzerland. The NETHS prototype can handle ISO-freight container with a weight up to 35 tonnes using two top lift beams hanging on chains. Swap bodies with a weight up to 20 tonnes can be handled by using concertina grapple arms. The NETHS is in principle designed for small and medium size terminals. The truck driver can do the transhipment semi-automatically. In a planned later version also fully automatic operation is possible, but this depends last but not least on the legal rules of the country in which the NETHS has to be operated. The NETHS is equipped with a remote control system, which has been designed and installed by the University of Zürich in Winterthur, Switzerland. The NETHS can move, also loaded with ILU, parallel to the railway track on its own crane tracks, which is 4.25 meter wide. Standing legs are not needed for the transhipment. As the machinery consist of two almost similar and mechanically independent parts, it can adjust itself to any length of the ILU. Concerning swap bodies the prototype is limited in handling those of class C (short version).

The prototype has already been erected in 2001 at an existing track siding of 35 meter length on the factory plant of Tuchschmid in Frauenfeld, Switzerland. The NETHS has been tested and modified within the InHoTra project and is in commercial operation since 2002. Planning for further small terminals in Switzerland are on the way (see Attachment 1). Further information can be found on the Internet at http://www.neths.ch.

NETHS Prototype in Frauenfeld, Switzerland
7 The Austrian demonstrator IUT

The principal of the Innovative Transfer Terminal IUT ("Innovatives Umschlag-Terminal") of ÖBB Rail Cargo Austria is the operational splitting up of transhipment, sorting and storage, therefor the processes can be done separately. The IUT consist of a land saving multi-level high-rise shelve for ISO-freight containers and swap-bodies up to a usable length on each storage place of 45'. A mainly vertical operating stacker with a shelf load/unload device is moving the ILU between the shelve and a buffer lane (pre-sorting area) beside the loading track. A portal crane is foreseen for unloading and loading of the rail and road vehicles.

The IUT test facility has a length of 30 meters, comprises two levels and can handle any commonly encountered container. The stacker crane and the shelf-operating device can cope with containers up to a max. Weight of 45 tons. Series production IUTs will have a length of up to 700 meters and up to 3 levels.

Work to plan the IUT was started in April 2000. The overall project has been completed in June 2003. The system shown here has been operable at the Wien Northwest terminal since January 2003. Involved had been Palfinger for the stacker, Künz for the shelves and its operating device and Porr for the foundation. It has been proved in the test operation that all resources necessary for transhipment (facilities, personnel, energy) can be optimised and a much greater flexibility in terminal operation can be achieved. Planning for commercial application of the IUT on several terminals in Austria is on the way.
8 The Hungarian demonstrator RTS

The RTS technology of Bosch Rexroth in Hungary is designed in three modular parts, which can work independently or together. They consist of the re-loader RTS 500, the staple lifter RTS 300 and the sorting field RTS 100. As with IUT the purpose of the separation is the independent and possible parallel operation of transhipment, sorting and stacking.

The RTS 500 re-loader with side lifting is a result of a project in the programme DIANE 6 promoted by the Swiss Ministry of Energy. Furthermore has it been developed in the European project IDIOMA, supported by the 4. FP of the European Commission. In commercial operation top lifting will be the preferable way of handling, the design has been made within the InHoTra project. The RTS 500 re-loader is running parallel to the loading track and sorting field on a standard gauge track. For loading and unloading two standing legs have to be put on ground for reason of stability. The machinery has two independent similar parts, so that it can be adjusted to any length of ILU that are to be handled. It can work under catenaries.

On the other side the sorting field is constructed of frames fitting to 20'-freight containers or swap bodies class C, which are lying are on rolls mounted that way, that they can be moved in two directions. If a longer ILU (40', swap body class A) has to be stored, two frames are put under it and are moved together simultaneously.

In bigger terminals a second RTS re-loader is arranged on the other side of the sorting field so that loading and unloading of trucks can be done independently.

To improve the storage volume of the sorting field, a staple lifter RTS 300, constructed similar to the top lifting re-loader, can stack ISO-freight containers and stackable swap bodies two level high on the frames of the sorting field.

The prototype of the RTS 500 re-loader and the prototype of the RTS 100 sorting field is installed in the Freeport Budapest, Hungary. The RTS 300 staple lifter is erected in the Ganz factory in Budapest, Hungary. Plans are on the way to build a complete terminal in the Freeport of Budapest and on other sites in Hungary.
RTS 300 staple lift, Ganz factory, Budapest, Hungary

RTS 100 sorting field, Freeport Budapest, Hungary
9 Specific advantages of horizontal transfer equipment recommended for further development and realisation

9.1 transfer under catenaries

Practically all-horizontal transhipment machines can load a loading unit from or on to a railcar while this railcar remains under the catenaries. As most of the mainlines of the European rail network are electrified, so that a locomotive change is needed before the intermodal train enters the terminal and transfer can start. In effect, some 30 – 60 minutes have to be added to the time needed for transfer, and a diesel locomotive has to be provided only for the activity to move the train into the terminal and out.

Most existing terminals have meanwhile found solutions to these problems. But with new terminals, special those with small amounts of loading units to be handled, horizontal transfer might be a valid alternative to current techniques. The main competitor will be most likely the reach stacker. But this machine can only operate on terminal sites without catenaries. It will be most interesting to calculate in connection with a new terminal and to check vehicle specific benefits can be achieved by the application of horizontal transhipment.

9.2 selecting transfer

Basically two methods of handling operation in terminals exist: The loading units can be removed from the train one after the other and transferred into a sorting field or directly onto a truck if it has arrived and is waiting. This method normally optimises productivity of cranes and is mainly appropriate for terminals with large-scale operation.

The other way of transfer is to select some given loading units for transfer and to leave the others – either temporarily or for the ongoing journey – on the railcars. Wherever such a problem arrives the specific ability of horizontal equipment to single out a specific loading unit and transfer it from (or on to) the railcar while the train remains on a track under catenaries comes into deliberation. Again the reach stacker will become the main competitor in that area but only for cases when the train does not remain under catenaries; as most important parts of the European rail networks are equipped with electrification, network parts that are not under catenaries are seldom.

So it is recommended to have a closer look into such cases with selected transfer such as linertrain operation or priority treatment of certain road vehicles. InHoTra made some first steps into that direction and discussed such type of operation in its workshop in Chur in Switzerland. The results were ambiguous. While Swiss Rail officials reported their firm willingness to develop this type of operation further, other experts gave some doubts whether this can be operated commercially under current price – cost relations.

Anyway, we state that these questions had not been looked after until now carefully, mainly because the appropriate technology was not available. Now, since InHoTra has provided for a technology choice, time has come to look more detailed into this type of intermodal operation that can serve markets that are not in reach for current intermodal offers. So InHoTra technology plus new approach to road/rail operation can exploit new market potential for intermodal transport.
9.3 commercial operation of small terminals

Since intermodal transport gains its main economic advantage by concentration of cargo to larger volumes, the case of small terminals has been neglected in research and development. Since privatisation of rail some new actors have demonstrated that even low scale solutions in intermodal transport can be commercially feasible. These operations are based on low scale terminals with an annual throughput of some 15,000 – 30,000 loading units. The traditional gantry crane with its capacity to handle some 50,000 – 80,000 units per year is certainly oversized in such cases. Horizontal transfer equipment may be a solution. Again the reach stacker will be the main alternative. But such mobile rubber tire equipped machines work with an axle load of some 100 tons. So they would need a costly strengthening of the terminal underground. The question of “small terminal” with low investment needs and low personal costs should be analysed more in detail. In the end we should even look at the case of a “do-it-yourself terminal”, i.e. a transfer facility without staff in which the truck driver executes documentation and operation of the transfer equipment.

9.4 commercial operation of downtown transfer facility

A specific case of small terminal might be a downtown transfer facility. One or more large intermodal terminals that are situated fairly well outside of the town district such as Valenton South West of Paris serve most metropolitan areas. The pickup and delivery operation using road vehicles goes over the town road network that often is specifically problematic with commercial truck use because of the people living in the neighbourhood. Some Metropolitan town administrations look therefore for possibilities to move a part of the loading units by rail near to the downtown area where they may be emptied (e.g. in a fruit and vegetable market hall) or even filled (e.g. in a garbage removal system). Today’s planning can organise that the relevant loading units arriving in the outside terminal are grouped together on an assembly of railcars. They can be separated from the intermodal train before it is shunted into the crane area, and a small locomotive can carry the railcar group to the downtown transfer facility. In such facilities two main conditions meet: low scale operation at competitive cost level, and equipment with low noise level. Such application needs clearly point at horizontal transfer machines such as those developed in InHoTra. We suggest collecting interested parties to undertake a feasibility analysis followed by a life demonstration.

10 Standardisation and technical rules

The current activities in standardisation, inter alia the European Commission initiative for the creation of a European intermodal loading unit, does not interfere with the concept of horizontal transfer as evaluated in InHoTra: One of the basic results of all evaluations was that horizontal transfer equipment has to adapt to the current state of standardised loading units. The other way, i.e. to adapt the loading units to a specific transfer technique, has shown as an approach without success. So, any technique of horizontal transfer equipment that can serve the existing standardised loading units, such as containers, swap bodies and semi-trailers, can be taken as a basis for on-going evaluation.

The question of technical rules is more problematic: Horizontal transfer equipment, as any other transfer equipment such as cranes and reach stacker, need for a acceptable sales price to be conceived, produced, and supplied on a European level. As long as such equipment is included in “rail equipment” category, it will be most likely that national railway safety authority will be concerned with the approval, and this means that the rules of approval (and later real
life operation) will be set on national level. In consequence, such equipment will have to be specifically conceived and adapted for national markets.

The European Commission is requested to have a closer look into that problem and to include this type of equipment into their already ongoing activities to create a Pan-European scheme of safety approval in the railway sector.

11 Results of work with the advisory board

The following external experts have been members of the advisory board of InHoTra:

Mr. Bernard Josselin, CombiConcept, France
Mr. Gerrit Nieuwenhuis, representative of ERRI, Utrecht, The Netherlands
Mr. Soren Rasmussen, International Road Union, Geneve, Switzerland
Mr. Wolfgang Müller, DUSS, Bodenheim, Germany
Mr. Steffen Nestler, Deutsche GVZ Gesellschaft, Bremen, Germany
Mr. Johan Woxenius, Chalmers Transport Dep., University of Technology, Göteborg, Sweden

11.1 purpose and work of the advisory board

As fixed by the guidelines, the purpose of the advisory board for the InHoTra project was to create a unit that provides more practical input for the project work by special experts having a practical view as well as a global background. This Board should have provided advice and recommendations on high-level management issues, including technical and exploitation matters for the project work and concerning the scientific results and the practical experiences.

The Advisory Board has focus the project results from the viewpoint of a neutral observer. The advisory board has not been asked for written comments or statements. Globally a substantial input has been given especially concerning the following basic questions and weak points:

- What are your personal expectations concerning the aim of the project?
- What impacts do you see for the introduction of horizontal transhipment technologies concerning the market and the current intermodal operation?
- Is the survey of existing technologies rather complete?
- How do you assess our evaluation scheme for the existing and future horizontal transhipment technologies?
- What is your opinion about the technologies and technique presented in the specific demonstrations?
- How do you see the future using areas for certain horizontal transhipment technologies?
- What basic requirements from your point of view have to be fulfilled by all such technologies to give the equipment a real chance for their introduction into the market.
Critical comments have been given on various occasions. As an example those concerning
the Swiss demonstrator are listed:

- The Swiss system looks rather complicated in comparison with existing technologies.
- The demonstrated Swiss system is very well suitable for linertrain operation as the NETHS
can work under the catenaries.
- The concertina grapple arms seem to be more reliable than the foldable telescopic legs
used today in vertical lifting.
- The system is limited as it does not move ILU longer than 8 meters and as it needs fix in-
stallations, which are two crane rails to be, build straight and parallel to the loading track.
- The velocity of the movement by the winch in lateral direction and the lifting and lowering is
relatively slow. The movement of the whole machine along the train is acceptable.
- Swap bodies with corner castings can be set down on ground, but those handled by grapple
arms cannot be put on ground except they have foldable standing legs.
- Twin lifting is not possible and the gross weight may not exceed 20 tonnes.
- Swap bodies longer than 7,82 meters cannot be handled, as the distance of the grapple
arms recess to the end of the swap body is longer than the free space under the concertina
grapple arms.
- Containers and stackable swap bodies cannot be stacked.
- The investment for a small terminal is rather high.

Concerning all demonstrators and technologies the comparison has always to be made with
existing vertical transhipment technologies as portal crane and reach stacker. These are the
technologies that are best known and well proved in the world market. The following costs
have to be checked in this comparison:

- The investment in infrastructure
- The investment in the transhipment machine and energy supply installation
- The costs of maintenance
- The cost of operation including personnel

11.2 meetings and workshop with the advisory board

Within the project several advisory board meetings have been arranged together with the
steering committee meetings on different locations. The advisory board had been informed
about the ongoing work both on the scientific and demonstration side. A meeting has been
arranged on 03.04.2001 in the first project year a Brussels to inform the European Commis-
sion about the successful start of the project.

As the demonstrators had realised their prototypes, the advisory board had the preferential
possibility to see the testing sites. The first visit of this kind had been made on 17.07.2000 to
the TRAI 2000 machinery, which already existed on the Costamasnaga factory site at Cost
Masnaga in Northern Italy in a more or less complete arrangement from the previous project
FLIHHTS. The second visit on 10.09.2002 to the demonstrator of Neuweiler has been made
as the erection of the next prototype had been completed, which has been the NETHS ma-
chinery on the factory site of Tuchschild in Frauenfeld, Switzerland. The final visit to the third
demonstrator of Bosch Rexroth had been arranged on 29.10.2003 at the RTS test site in the Freeport of Budapest and in the factory hall of Ganz in Budapest, Hungary.

As the intermediate results of the scientific part of InHoTra had been available, an advisory board meeting had been on 18.12.2004 in Chur, Switzerland. It has been arranged as a workshop open to the interested public including the press. The conference language was German as most guests came from Germany, Switzerland and Austria. The general question, which had been tried to be answered within the workshop, was:

**Combined transport on short distances and in rural areas - Does the railways have a chance?**

It appeared that there are two different philosophies. The first one (mostly situated in Austria and Switzerland) is promoting the linertrain solution with intermediate stops at terminals with minor throughput. In contrast to this the opposition (mostly situated in Germany) is keeping strictly to the existing point-to-point connections and gateway terminals, probably extended in the future by feeder and shuttle train connections through mega hub to be build. A well working example of low flow intermodal solution had been visited in Landquart afterwards.