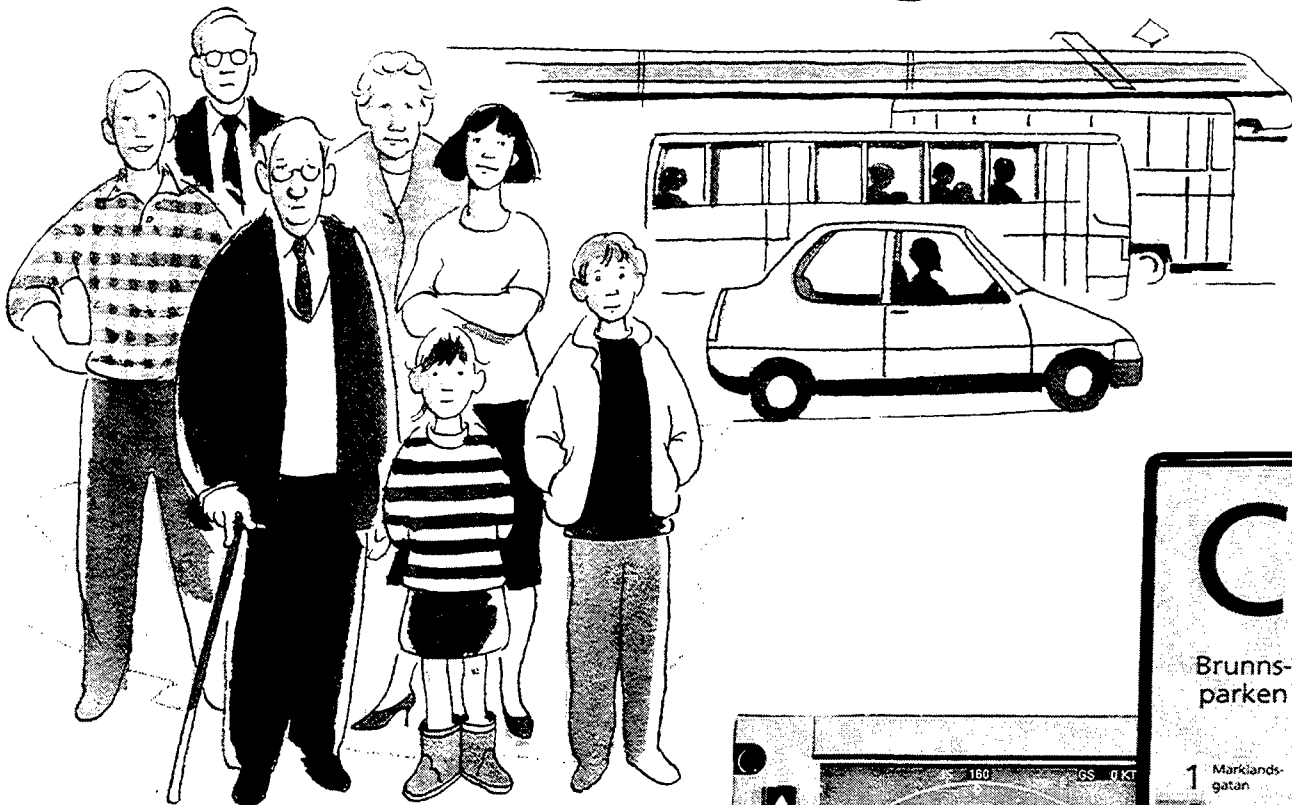


People, Transport and Information Technology



PB99-101073

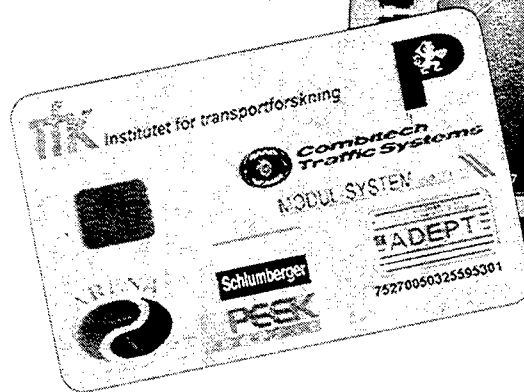


C
Brunns-
parken

1	Märklands- gatan	7
6	Guidheden	8
8	Sahlgrenska	2
58	Lindas	22
60	Fredriksdal	10

Mer och var går bussen eller vagnen?
De 8 närmaste avgångarna:

1	Märklands- gatan	7
6	Guidheden	8
8	Sahlgrenska	2
58	Lindas	22
60	Fredriksdal	10



Swedish Research into Transport Informatics



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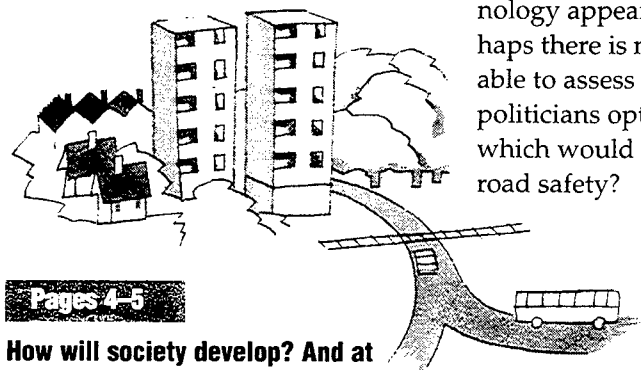
KFB-Information 1997:9
November 1997
ISSN 1104-4659

We conduct research into IT and

The business community, public activities and individual citizens in a modern society are dependent upon efficient, safe and well-developed communications.

The Swedish Transport & Communications Research Board, KFB, has therefore, an important task to support transport and communication research in Sweden and to contribute to international co-operation.

This publication presents an overview of KFB-supported research and development projects, which deal with how IT can improve transport on land, at sea and in the air.



Pages 4-5

How will society develop? And at what cost to the environment?

A presentation of a number of projects which discuss how the society of tomorrow can be affected by transport integrated with various IT applications.

Perhaps technicians have too positive a perception of the effects? Can a durable future environment be reconciled with transport development? Is it facilitated by IT?



Pages 6-7

Road transport development using IT – possible scenarios

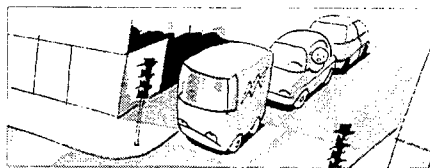
A summary of a project which aims to assess the future effects of transport telematics using three future

scenarios. The prospects for technology appear to be good, but perhaps there is not enough data available to assess the future. And dare politicians opt for those systems which would dramatically improve road safety?

Pages 8-9

Public transport, information and travel

Motorists often underestimate the costs of travelling by car and think travelling by public transport takes longer than it actually does. One way of increasing the use of public transport is to improve information about it by using IT. A presentation of a large information project in Gothenburg and a project which aims to assess if we can expect more public transport on demand in the future.



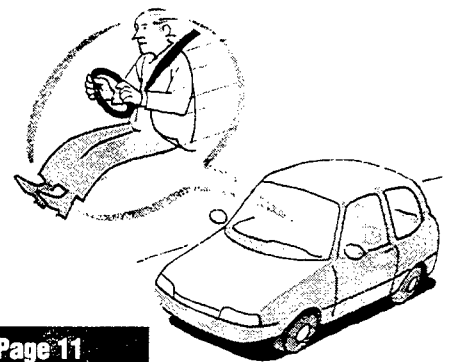
Page 10

Road transport and the automobile

Politicians and technicians can plan transport systems that work per-

fectly in theory. But will thousands of road users make millions of decisions the way transport planners predict? Should road users always be informed of congestion at a particular time on a particular road? And do traffic lights always improve traffic flow?

Searching and paying for parking spaces is time-consuming. An international project is hoping to simplify car parking and make it more effective.



Page 11

Drivers and the automobile

People have their limitations. Can technology be used to help us in an emergency traffic situation? Two international projects are studying this. They test and evaluate technology which assesses driver behavior, issues warnings and, when necessary, takes control of the vehicle.

Another project develops further the electronic driving license. Anyone without a valid driving license cannot start the car!



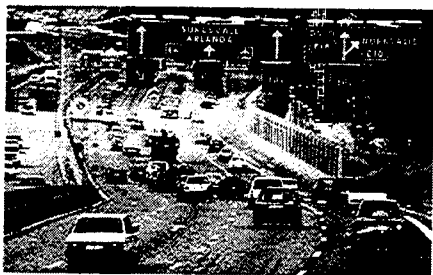
Pages 12-13

Safer air traffic and better goods transportation with IT-support

Several projects supported by the EU develop better technology for air traffic control and navigation. These are, in part, based on

Swedish inventions. Satellite navigation is combined with radio datalink transmission of data. Pilots and air traffic control have access to the same visual information.

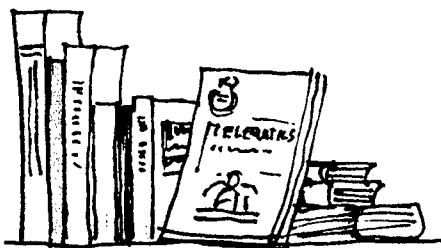
Several EU projects study how the distribution of goods can be improved on land, at sea and in the air. The possibilities of making combined (intermodal) transport more effective by using IT-supported routines and systems are especially interesting.



Page 14

A center for transport research

A presentation of how to set up a center for transport research which is also a good environment for researchers from around the world. One of the main tasks is developing good aids for creating models and transport simulation.



Page 15

Projects and references

Included here are project addresses, contact names and references to available publications.

KFB – The Swedish Transport and Communications Research Board

KFB is a government authority with planning, initiating, co-ordinating and supporting functions in Swedish transport and communications research.

KFB's activities encompass transportation, traffic, postal services and telecommunications, as well as the impact of transport and communications on the environment, traffic safety and regional development.

Four areas of research

The areas of research supported by KFB are divided into four programs: Strategic Communications Research, Telematics, Physical Transport, and Vehicles and Fuel. The programs consist of a number of subprograms. The most important of these are presented in the list to the right.

There are also two fields of research which are incorporated into all four programs – environment and public transport.

International co-operation

KFB works for an increase in internationalization of Swedish communications research. It aims to create contacts, start and co-ordinate cross-border research co-operation and export Swedish research.

Who receives research grants?

Slightly more than 80 percent of funds are allocated to universities, institutes of higher education and other public research institutes, and around 15 percent to

private consultant firms, institutions and companies. The remainder goes to local governments and authorities, etc.

Information, documentation

KFB is also responsible for information and documentation within its areas of responsibility.

KFB's four research areas:

1 Strategic communications research

- Mobility of people and goods
- Strategic environmental research
- Infrasystems
- Planning instruments

2 Telematics

- Structural changes in the IT-society
- Economy, markets and regulations
- Legal aspects
- Information technology and its applications
- Telematics for the elderly and disabled
- Research related to postal services

3 Transport

- Passenger transport
- Goods transport
- Road safety and transport engineering
- Road and infrastructure engineering

4 Vehicles and Fuel

- Biofuel
- Electric and hybrid vehicles

How will society develop? And a

Information technology has, ever since the introduction of the telephone, changed society. How will Advanced Transport Telematics affect people, companies and transport in the 21st century? How will the environment be affected?

Will Transport Telematics "reconstruct" society?

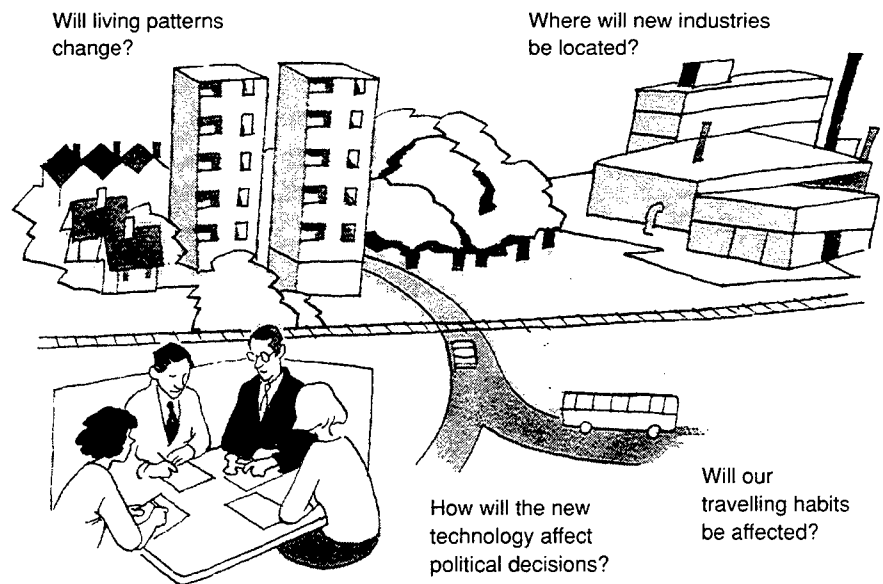
Several large research programs in the Road Transport Informatics field were launched during the 1980s in order to develop IT applications for road transport. The international programs PROMETHEUS and DRIVE aimed to integrate the motorist with the road and the car.

Other projects joined together public authorities and private companies into various kinds of IT systems for transport management, information and road signs. But do the new systems offer desirable social consequences?

In the project **Prometheus behind the steering wheel** (University of Linköping), the development of road informatics in Sweden has provided the background for a number of ethnographic studies of engineering working conditions. In which way do technicians treat the uncertainty that is present in the evaluation of trials?

By using considerable resources to carry out extensive technical trials and demonstrations, and by describing how the system can be used and what it is good at, technicians arrive at a consensus which is used to convince others of the new system's excellence.

As a result of the project, research is being planned into the everyday interplay in traffic. This may lead to the design of a more open communications technology.



Achieving sustainable development with IT

Several transport informatic projects have led to positive environment effects. But what demands should we make on information technology to ensure that effects lead to a sustainable development?

This is the main issue for the project **Sustainable development and information technology – how can they be united?** (The Royal Institute of Technology, Stockholm).

Firstly, the project analyzed the demands that should be made on a future transport system to ensure sustainable environmental development.

Subsequently, four technical scenarios were drawn up where future transport telematics could contribute to environmental improvements:

- *Car Pooling*, a system for automatic matching of travelers who want a ride with drivers who can pick up passengers – an attempt to combine private car driving with public transport.
- *Dynamic Route Choice*, a scenario based on the private car. The performance of the urban transport system is optimized by using dynamic road user fees.

- *Extended Public Transport* aims at raising the attractiveness of public transport by improving information and extending the information service to include taxis, rental cars and bicycles.
- *Dual Mode*. This scenario combines the potential for efficient energy use in public rail transport and other electric vehicles with the flexibility of the private car.

An international Delphi panel of 100 experts from 20 countries responded to questions on feasibility, impacts and economy of the four scenarios.

The majority of experts promoted a scenario based on public transport information. That scenario was expected to lead to environmental improvements but at the cost of less comfortable journeys and longer travel times.

The conclusion is that the development of transport telematics should focus more on public transport applications. This implies a shift in many current development programs.

What cost to the environment?

Can we predict how travel will develop?

New societies grow, residential areas are planned, and roads and transport systems are constructed. Authorities and companies select suitable areas for industrial location. All modern social planning is affected by information technology.

But how will people change their living patterns as a result of the new technology? Which groups of people will choose distance working? Will companies choose new strategies for industrial location? And how will people travel in the new society? This is studied in the project **IT and traffic planning** (Institute for Regional Analysis INREGIA).

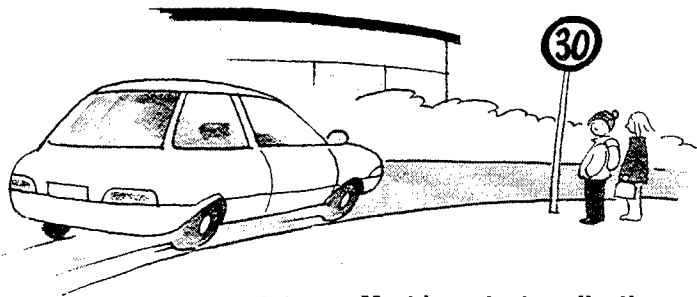
Information technology can provide passengers with better information before and during journeys. Journeys involving changes between different modes of transport (known as intermodal journeys) are also facilitated. Transport management, navigation systems and electronic payment systems also influence passenger choice of route and means of transport.

The project will use existing models for analysis of industrial location and transport and establish a working method, which can be used to analyze how IT affects travelling patterns. This analysis and working method will then be adopted in a region (probably the Stockholm region).

One hypothesis is that new living patterns, offering an increase in opportunities for distance working, will lead to more and longer car journeys but less frequently.

Research results can be useful for the development of public transport and information on the possibilities of intermodal travel (journeys with several means of transport).

What does the general public think about the future of transport informatics?



Technicians, social planners and decision-makers have many ideas for improvements to the road transport system. They have an idea of how their hopes can work in practice.

Many KFB-supported projects analyze possible effects of the introduction of intelligent transport systems. Sometimes these evaluations have a technical bias. In order to introduce new transport technology, normal users (i.e. road users) must be made aware of the new technology, accept it and consider it useful.

The study **Transport informatics from a user's point of view** (Institute for Regional Analysis INREGIA, KFB report 1997:2) has mapped out road user knowledge and interest in transport informatics applications. Studied applications are:

- electronic payment (smart card) systems
- navigation systems
- on-board traffic information
- travel planning from home or office
- public transit information
- automatic speed control
- electronic driving licenses
- parking information systems

2,000 telephone interviews were carried out. People interviewed have been divided into groups based on age, sex, education, place of residence, driving license ownership and level of IT competence. Some of the results of this study are described here.

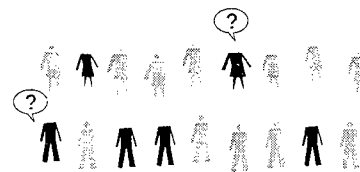
Most important applications to introduce

There is a considerable general interest in *Automatic speed control* on streets with a speed limit of 30 km/hour. Regardless of background parameters this application has the highest ranking except in two cases, in which it is ranked second.

11 Portswood Swaythling	1 min
48 Eastleigh Fair Oak	2 min
4 Shirley and Totton	4 min

Traffic information systems

When asked which application would provide the greatest personal benefit, most answered *public transport information*.



Lack of knowledge

About two thirds of future users lack knowledge about the studied applications. This is especially true of women, those with limited education and those with low IT competence. The survey also indicates significant differences between the knowledge and priorities of men and those of women.

Scenarios for road transport developo

What role will transport informatics play in the year 2020? How will the environment be affected, the number of accidents, the national economy? And what decisions will politicians dare to make?

The TOSCA project

The **Tosca project, Test-site Oriented Scenario Assessment** (Transek AB), has sought to draw general conclusions from the trials carried out by the National Swedish Road Administration in transport informatics in Gothenburg, the **ARENA project**.

Results from international projects and expert opinion have also been taken into account. Results show that the application of information technology in the transport

area can have very great, positive effects – especially if parliament and local authorities dare to make future-oriented decisions promptly.

The TOSCA project's scenarios

As a basis for evaluation, different scenarios were drawn up for future development:

- **Reference scenario:** A possible development where transport informatics is not implemented.
- **Trend scenario:** Transport informatics develops based almost entirely on market conditions. No radical political decisions affect development.
- **Strategy scenario:** Transport informatics is introduced through political decisions based on the transport policy goals decided by the Swedish parliament. For the strategic scenario for the year 2020 goals were established for the reduction of road fatalities and injuries, and for the degree of environmental improvement.

Applications of transport informatics

A list was drawn up of slightly more than 20 applications for information technology in the transport area. Applications were grouped into five areas:

Transport management. Different methods for controlling traffic lights, managing disruption, guiding heavy or ecologically harmful transport to certain roads, controlling traffic on motorways.

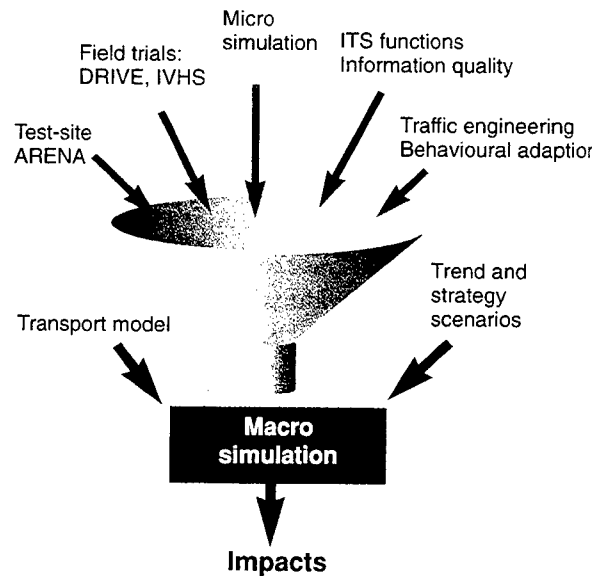
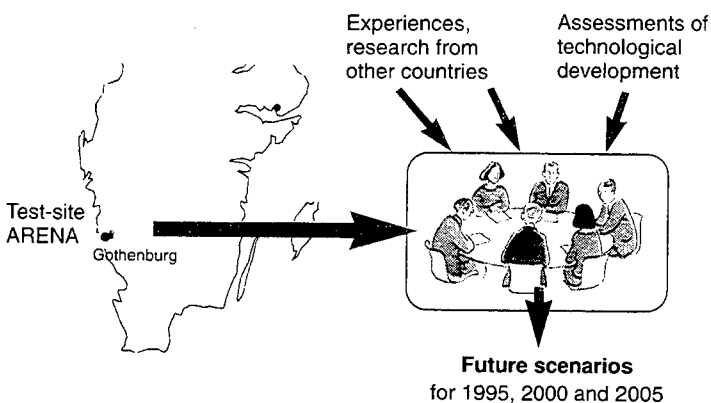
Information systems. IT aids for journey planning, maneuver help for drivers, public transport information, parking service.

Navigation systems. Warning for disruption, state of roads. Navigation systems which offer the driver advice on suitable routes.

Automatic debiting systems. Automatic debiting on approach roads and tollgates. Environmental fees. Dynamic car fees dependent on type of vehicle, road, traffic, environmental disruption etc.

Developing a method to evaluate system effects of Advanced Transport Telematics

The method for evaluating future effects of road informatic systems which has been used in TOSCA, is described and evaluated in the project **Assessment of the effects of integrated transport telematics scenarios** (KTH, Institution for infrastructure and social planning).



Test-site Arena

The practical testing activity in the area of transport telematics began in Sweden in 1990 with the foundation of test-site ARENA (The Gothenburg region including the city and connecting European highways). The Swedish National Road Administration is the responsible authority for ARENA.

TOSCA I (1990–1992)

TOSCA I evaluated the effects of the first trials in test-site ARENA. The results were supplemented by experiences from other countries, assessments of technological development, etc. A number of experts compiled three future scenarios for 1995, 2000 and 2005. It has become apparent that the experts have underestimated the problems of introducing the new technology.

TOSCA II (1993–1995)

New scenarios were worked out. Based on continuing trials in ARENA, field trials in other countries, micro-simulation etc., a macro-simulation was compiled for the effects road informatics could have in the different scenarios.

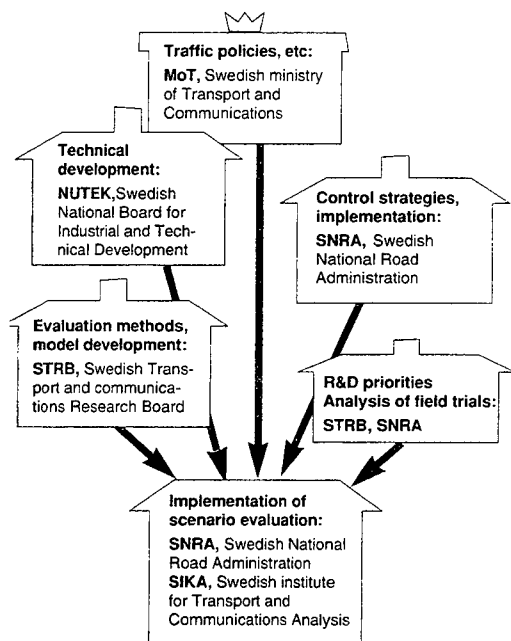
The project has provided considerable knowledge, which can be used in later development work. There is a lack of knowledge in assessment of the behavior of road users, among other things. It is also apparent that the quality of the information upon which the telematic applications are based is often inadequate. The conclusion is that inadequate information is counter-productive!

Cruise control systems. Warning for obstructions. Variable speed limits on bad roads. Intelligent speed control in cars. Compulsory, automatic systems for adapting speed to road conditions and hazards.

On the right is an account of the effects the TOSCA project estimates the applications will have on travel time and transport work, and safety and the environment.

Transport informatics in Europe

KFB has commissioned a supplementary overview, **An evaluation of the effect of transport informatics in Europe** (KFB report 1997:1). The authors are of the opinion that investment in certain types of road informatics can be carried out without negative effects on the national economy.



Orientation of future evaluations

The KTH project has discussed the terms for a future development of the TOSCA methodology. In order to spread the preparatory work and obtain higher quality information, it is suggested that basic facts and prognoses should be carried out as a part of work for different authorities. The developed TOSCA methodology for different future scenarios can then be used by the Swedish National Road Administration in its regular planning.

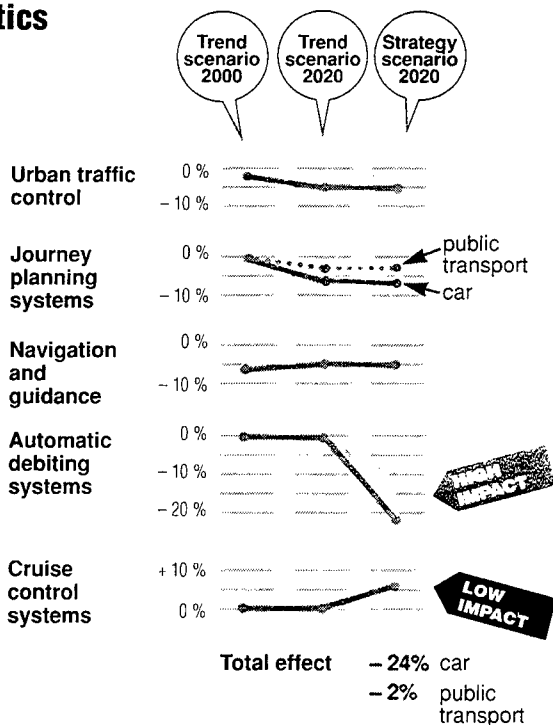
Integrated effects of Transport Telematics

Travel time

Travel time is in the short run most influenced by Urban traffic control and Route guidance.

The comparison between the trend and strategy scenarios in year 2020 shows that Dynamic speed control reduces time savings.

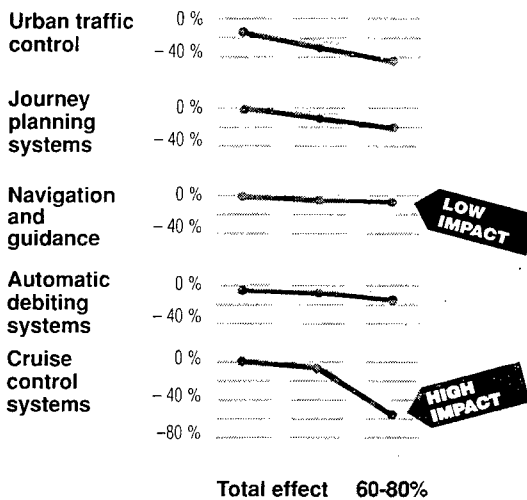
The total effect for car traffic is estimated at 20-24% in the strategy scenario in the year 2020.



Traffic safety

Traffic safety will best be improved until year 2000 by Urban traffic control.

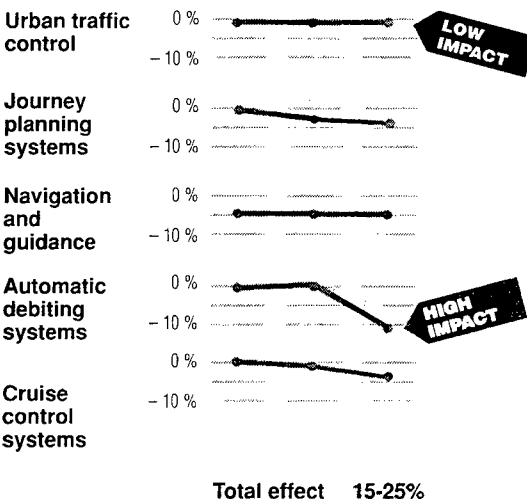
In the long term contributions will also come from Information systems, Route guidance systems and Automatic debiting, especially through modal shift to public transport. The experts see a tremendous potential for Cruise control systems. The total safety effect can be as much as 60-80% in the strategy scenario 2020.



Emissions

The emissions are mostly influenced in the short term by Route guidance systems.

Of great significance are the development of engines and the requirement levels for vehicle emissions. The total effect expressed in NO_x equivalents is about 8% in the trend scenario for year 2000.



Public Transport, Information and

Car traffic is on the increase in the whole of Europe at the cost of public transport. Motorists have an exaggerated idea of time saved when travelling by car. At the same time they underestimate the costs of travelling by car. Could better travel information be a key to more people choosing public transport for all or part of a journey?

Gotic – real-time public transport information

Since 1987 a public transport information system based on computer technology has been developed in Gothenburg. The system provides real-time information about bus and tram times, disruption, etc.

Up-to-date information about public transport should be readily available at home, at work, in town, at bus and tram stops or on buses and trams.

Since 1994 development work in the research, development and demonstration project **Gotic – Gothenburg traffic information centre** (researchers at Chalmers University of Technology, Gothenburg) has been carried out in co-operation with manufacturers and users.

Researchers wish to create as user-friendly a system as possible. The information displayed on signs, displays and monitors, as well as dialogue procedures for travelers, is based on extensive trials.

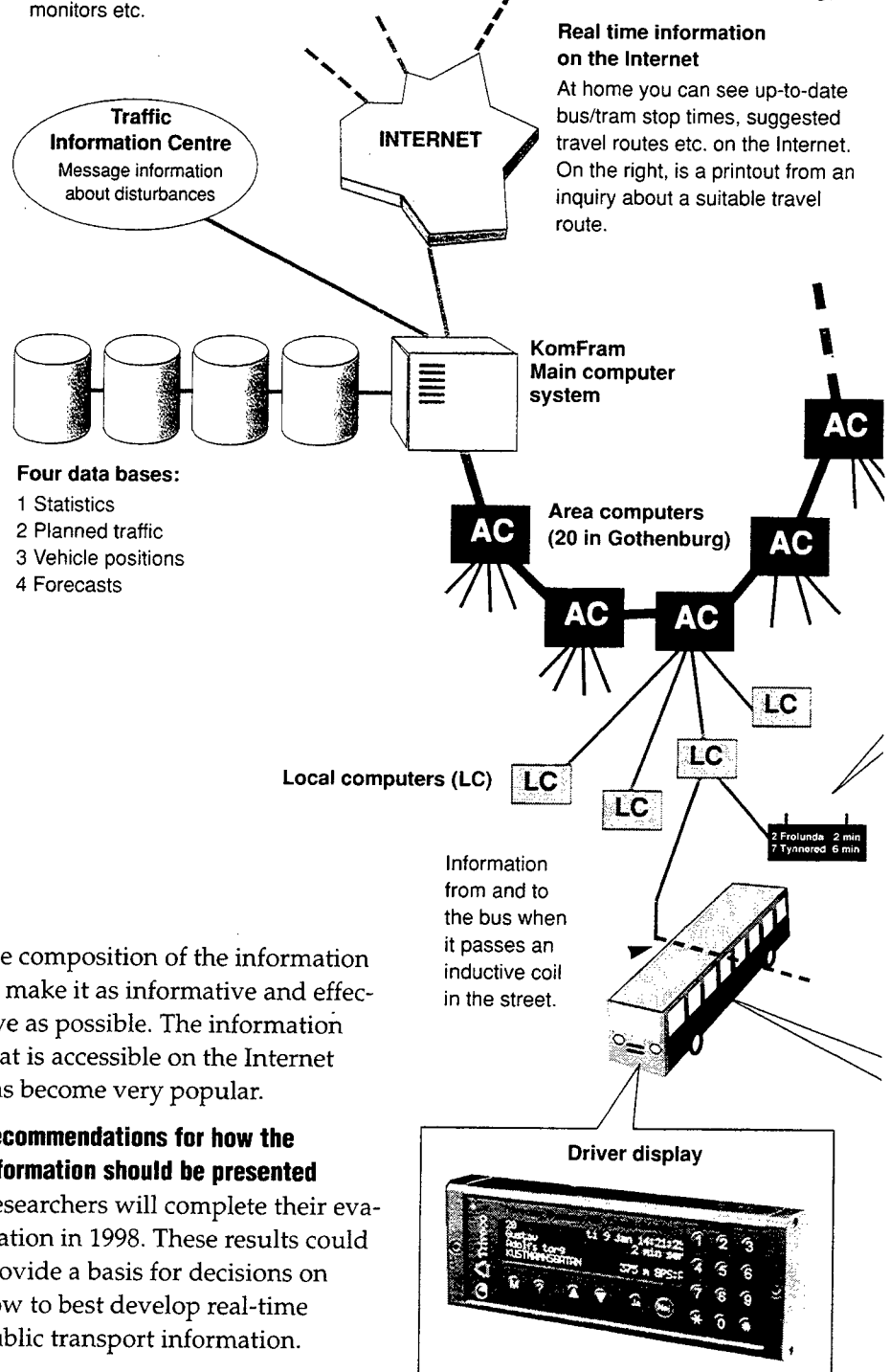
Trials using different media for traffic information

Various trials are being carried out within the Gotic project regarding different methods and media for supplying passengers with current information before, during and after a journey.

Research is being carried out into the construction of signs, displays and monitors, and also into

Where does the information come from?

The real-time information comes from a data and communications system, *KomFram*, which includes the whole of Gothenburg's public transport network. Here you can see how *KomFram* is built up and how information is processed and then shown on displays, signs, monitors etc.



the composition of the information to make it as informative and effective as possible. The information that is accessible on the Internet has become very popular.

Recommendations for how the information should be presented

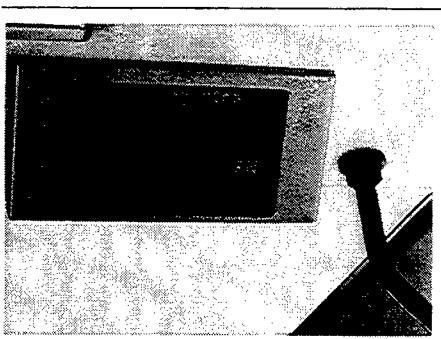
Researchers will complete their evaluation in 1998. These results could provide a basis for decisions on how to best develop real-time public transport information.

[Fakta om TIS Hjälp Ny fråga]

Från hållplats Hagakyrkan.
Till hållplats Liseberg
Avgång tidigast kl. 22:30
Total restid: 00:15 Antal linjer: 02
Färdsätt Spårvagn linje nummer 3
Från hållplats: Hagakyrkan Tid: 22:36
Till hållplats: Valand Ankomsttid: 22:41
Restid: 00:05
Färdsätt: Spårvagn linje nummer 5
Från hållplats: Valand Tid: 22:47
Till hållplats: Liseberg Ankomsttid: 22:51
Väntetid: 00:04 Väntetid: 00:06



Electronic display at bus/tram stops
A number of ways of displaying real-time information are being tested at bus/tram stops with shelters. The route, destination and the number of minutes to next departure are shown on an LED-display (light-emitting diodes) using a typeface, which has been specially developed for good readability, even in sunlight. Message information is also shown when disturbances occur.



Signs in buses and trams
Tests are being carried out using electronic signs in buses and trams. The displays show route number and the names of the next two stops.

Public transport on demand: Phone a bus!

To a certain extent, all public transport is governed by demand, since routes and timetables are adapted to passenger demands. The problem primarily concerns the time from planning to realization.

What is meant here by public transport on demand is that the time between planning and journey is very short and that the individual passenger can influence the journey.

The project **Demand responsive transport with ATT** (Transek AB, Solna) has produced an overview of various public transport on demand trials in different countries.

In order for public transport to become competitive, it is primarily passenger walking time, waiting time and changing time which have to be shortened (see diagram below). Public transport on demand hopes to achieve just this.

In order for IT-supported public transport on demand to succeed, the transport system has to be flexible, provide reliable and fast information to passengers, operate in real-time and manage bookings.

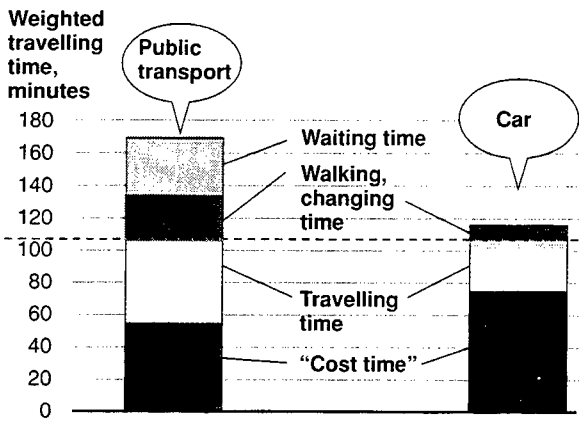
Some experiences from the trials mentioned include:

- The systems expand over time
- Often conflicts with competitors, i.e. taxis
- Some systems result in cost savings, while others lead to cost increases, but if public transport on demand is introduced as an extra service to the normal scheduled services then costs increase.

Continued research and development ought to concentrate on finding possibilities to change timetables at short notice, to reduce time from planning to journey and to create incitements for motorists to change to public transport.

Competitive disadvantages for public transport: waiting time and walking time

A comparison between commuting by car and by public transport (the Västerås region in Sweden). If the cost of the journey is recalculated as "travelling time value" in minutes (weighted travelling time), it is the waiting time and the walking/changing time that makes up the whole of the competitive disadvantage for public transport journeys. The combined time sacrificed for travelling and travelling costs are on the whole the same.



Examples of public transport on demand systems

	Normal stops	Stop-to-door service	Door-to-door service
With a timetable	Passengers phone so the bus stops at a particular bus stop.	Passengers order the journey from a particular bus stop to an optional address in the district.	Passengers order the journey from an optional address in the district to another optional address in the district.
Without a timetable	Passengers order time for journey and stop.	Passengers order time for journey, bus stop and alighting address.	Passengers order time for journey, boarding and alighting addresses.

Road transport and automobiles

How can one choose a route based on reliable information?

Many road-users stuck in a queue of cars, wish, no doubt, that they had had access to up-to-date information on road congestion in order to have begun their journey at another time or chosen another route.

The project **IT and drivers' behavior** (Institute for Regional Analysis INREGIA) aims to illustrate how traffic flow information affects road users and their choice of route and starting time in journeys from home to work.

But how should the information be formulated in order to lead to a uniform traffic flow? This is an important question for the project. Studies will be carried out to discover how work and working hours affect road user behavior.

Perhaps, based upon this information, many choose to begin their journey later. Does this mean that a potential traffic peak will be replaced by congestion at another time? The hypothesis is that if information to road users is not well organized, it can result in large shifts in transport congestion because of the time lag inherent in the system.

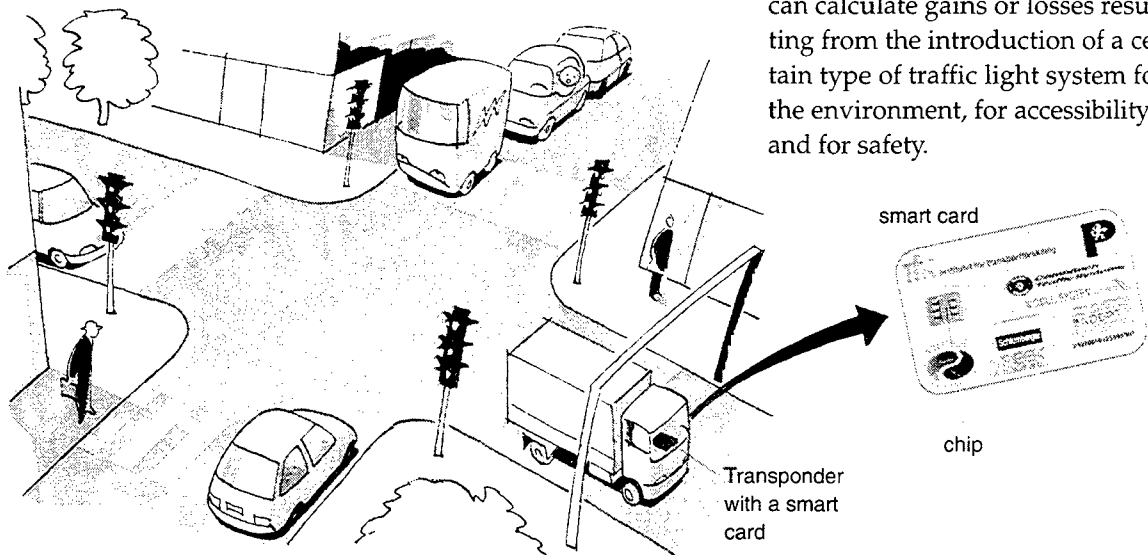
One aim is to construct a dynamic traffic flow model for different passenger information scenarios. It may show that supplying information is not always the best solution. The model can in the long term be used for the design of information systems which can offer an even traffic flow.

Network effects of traffic lights

When an area is improved by traffic lights the aim is, of course, to create a more even traffic flow and reduce journey times for those passing the crossing.

Practical experience shows, however, that the theoretical improvement in journey time is reduced when put into practice. Why? Simply because of an increase in traffic on the road, which counteracts the improvement!

This problem is studied in **Network effects of urban traffic control** (Transek AB). Initially, local effects of improved signaling will be studied. The results will then be used to calculate effects over a larger area. By using this method, one can calculate gains or losses resulting from the introduction of a certain type of traffic light system for the environment, for accessibility and for safety.



Paying for parking with a smart card

In the EU's Fourth Framework Program, there is a project being carried out in six countries concerning debiting and information systems for parking and road fees.

In the Swedish part of the project, **ADEPT II, Automatic Debiting and Electronic Payment for Transport** (TFK, The Institute for Transport Research, Stockholm), systems for information and automatic debi-

ting of parking fees are being developed, tested and evaluated.

Information about the parking situation is available through messages to mobile phones. You can also reserve a parking space over the Internet. A smart card is used for debiting parking fees. The card can be electronically "recharged" with money from the motorist's bank account. The card is placed

in the car, in what is known as a transponder. The card pays the fee when the car passes equipment at the parking lot, which exchanges information with the transponder via microwaves.

Co-operating on the project are the National Swedish Road Administration, Telia, Combitech, the City of Gothenburg and researchers.

The Driver and the Automobile

Vehicle control in emergency situations

How does a driver respond in an emergency situation? This is being studied in the project **SAVE – System for effective Assessment of the driver state and Vehicle control in Emergency situations**, which is an EU project with participants from seven countries. The Swedish part of SAVE is being carried out by the

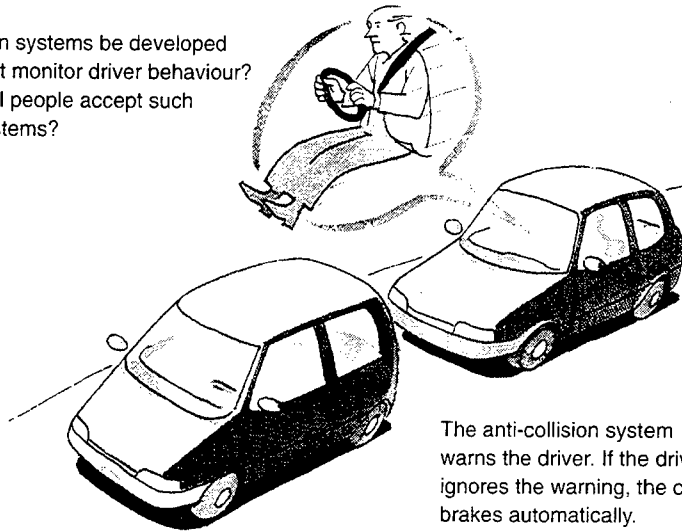
VTI (the Swedish Road and Transport Research Institute, Linköping). Normal motorist behavior is studied and then compared to behavior when the driver status is impaired or when a stressful situation has been experienced.

By using simulators, researchers hope to find variables that signal

when driver status in a given emergency situation is worse than usual.

The aim is to develop and evaluate automatic systems which can monitor driver behavior and, in an emergency situation, take command of the car and bring it to a controlled halt.

Can systems be developed that monitor driver behaviour? Will people accept such systems?



Anti-collision systems

The project **AC ASSIST – Anti-Collision Autonomous Support Safety and Intervention System** develops, tests and evaluates systems which inform or warn motorists of the risks for a collision in the direction of travel. The system can also intervene and brake the car in a critical situation.

AC ASSIST is an EU project. The Swedish part of the project is being carried out by VTI, Linköping, and has studied the interaction driver-vehicle and has indicated what demands can be made on the development of a system using dynamic speed control.

An initial series of simulator tests have been carried out in Linköping. The driver sits in a realistic automobile simulator. Two types of warning have been tried when the

risk for a collision is imminent. One is a spoken, recorded message. The other is kinetic; the driver feels a distinct jerk in the car before an imminent collision. If the driver ignores the warning, then the car brakes automatically.

The simulator trials have included both male and female drivers of various ages. Trials show that most collisions occur when the warning system is not on, which suggests that such a system could have a role to play. It is interesting to note that the tests show that the group of drivers who are involved in most collisions in the simulator are middle-aged drivers who have a tendency towards slightly more "aggressive" driving than younger and older drivers.

Electronic driving license

With a grant from the National Swedish Road Administration, *CSS Card Safety System AB* has developed an electronic driving license, which is undergoing trials in a number of cars. The cars cannot be started until the card, which is a smart card containing a contact chip, has been inserted into a card reader in the car.

Data on driving qualifications and conditions for starting the car can be stored on the driving license chip. There have been trials with an alcohol lock, which means a driver under the influence of alcohol cannot start a car.

In the project **Development and testing of an electronic driving license**, the system is modified and adapted to new functions. Worn contact cards sometimes lead to reading errors. The system is also sensitive to the cold. As a result, cards using a non-contact chip, RF-ID chip, are being tested.



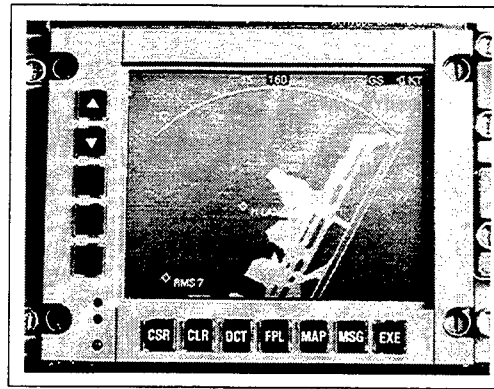
Air safety and IT

To ensure safe air traffic it is essential that ground stations and aircraft pilots have an adequate awareness of plane position, speed and direction.

A number of European projects, sponsored by the EC, DG XIII, are developing and evaluating such a technology, based in part on Swedish inventions.

The basic idea is that aircraft transmit their position (usually derived from a Global Navigation Satellite System, GNSS, receiver) over a radio datalink. Position information is transmitted and received by every aircraft in the vicinity. Ground vehicle and fixed ground stations can also be equipped to transmit and receive position data. The system is known as *Automatic Dependent Surveillance – Broadcast, ADS-B*.

The following international projects in the field are supported by KFB and *Swedavia AB* manages the Swedish sections of these projects.



A cockpit display shows the position of all aircraft in the region.

The position is transmitted to every aircraft in the region, and to ground stations and airport ground vehicles.

Common data for pilots and air traffic control

The **FARAWAY** project studies the effects of supporting both air traffic control and flight navigation with ADS-B and radar. Trials are being carried out in Rome.

Approximately 25 transport planes and 14 airports with ground vehicles are included in a network across large areas of Sweden, Denmark and Germany. The objective of this project, **NEAN-North European ADS-B Network**, is to develop

the new datalink and networking technology. The ground stations in the network are providing ADS-B surveillance data and GPS corrections. Once a ground station receives position reports, they are distributed throughout the network to air traffic control and other users.

IT revolutionizes goods transport

The port as a hub in the intermodal chain

The **EUROBORDER** project (sponsored by the EC, DG VII, co-ordinated in Sweden by TFK) is studying ports as a hub for combined (intermodal) transports. It is trying to discover problems and bottlenecks relating to port information and organization. It aims to suggest improvements, especially in Ro-Ro traffic.

The Swedish section of the project has produced a computer model for optimizing a port. The model has been based on the port of Gothenburg.

Using the model, effects of altering port routines in different ports can be simulated and the effects on

the competitiveness of the port and the whole transport chain can be assessed.

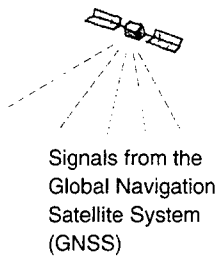
Identifying freight carriers

The objective of **INTERPORT** (sponsored by the EC, DG XIII, co-ordinated in Sweden by TFK) is to test a system of automatic identification equipment integrating the physical movements of vehicles and containers in the ports with the information flow via the EDI (Electronic Document Interchange) network.

In Helsinki, trials are taking place using smart cards to identify the driver of the freight carrier to or from the port. Other ports are testing electronic identification of

containers and trailers using what are known as RF-tags.

The project hopes to provide specifications for automatic equipment identification (AEI) systems which can cope with port co-ordination of goods movement from land, road, rail and waterborne transports. The system must also be easy to integrate with the ordinary electronic document interchange network (EDI).



Improved use of satellite navigation in traffic systems

The **MAGNET-B** project is studying what advantages air traffic, train services and shipping can gain from satellite navigation systems combined with ground based data-links. Landing operations, rail network management and narrow sea channel operations are some areas studied.

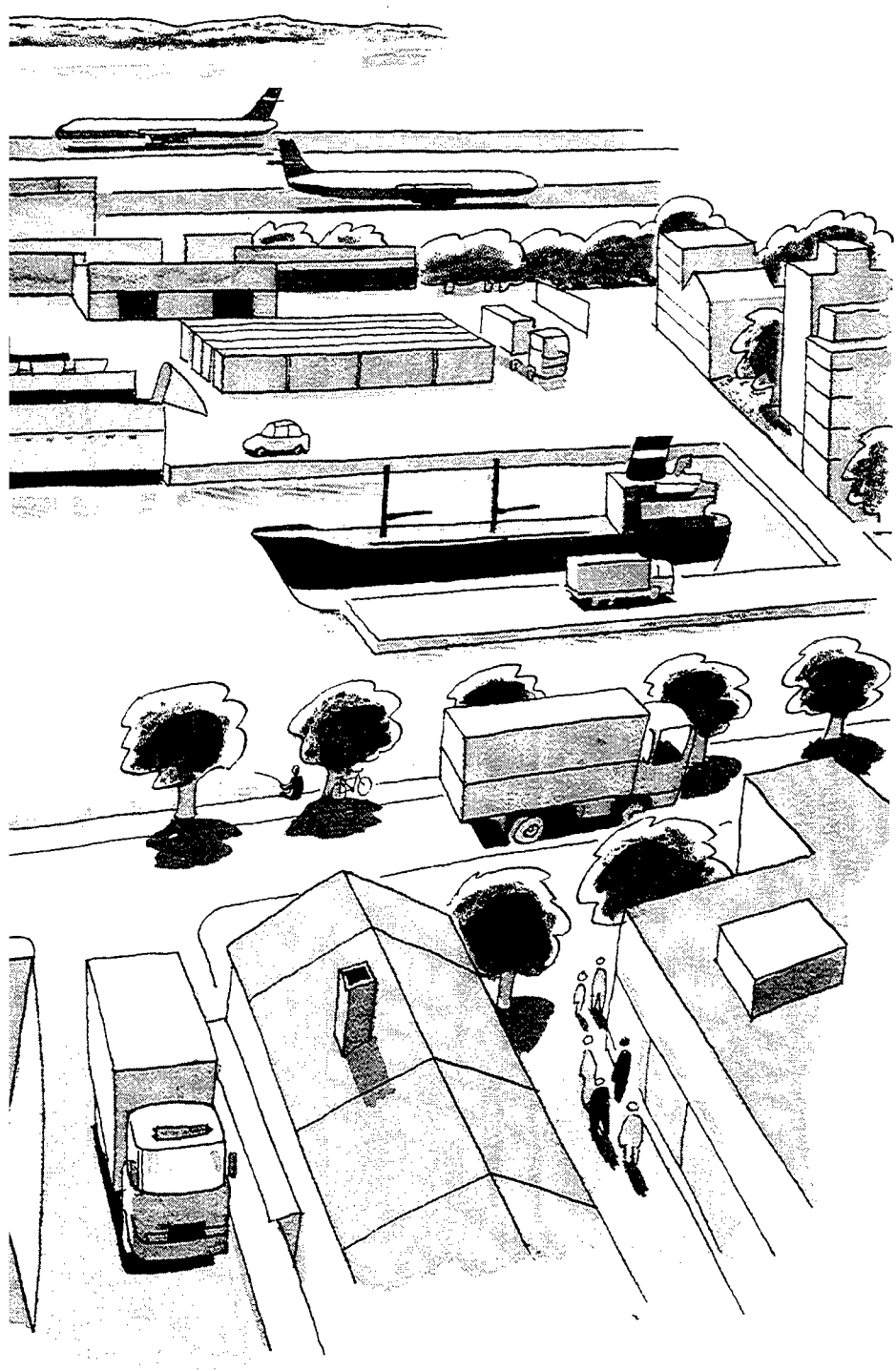
The future of general aviation

What demands will future general aviation make on communication, navigation and supervision? The **SUPRA** project focuses on these issues. The use of datalink technology and cockpit display of traffic information for general aviation aircraft and ground vehicles are studied and demonstrated.

Future air traffic management

Two projects (sponsored by the EC, DG VII) study the development of Air Traffic Management systems (ATM) in Europe.

The **CASCADE** project is making an inventory of validation tools for ATM systems. **MAICA, Modelling and Analysis of the Impact of Changes in ATM**, develops new computer simulation models for future ATM systems in Europe.



Goods delivery in urban areas

In cities across Europe, many freight lorries drive from the same wholesalers to the same stores day after day. The aim of **SURFF, Sustainable Urban and Regional Freight Flows** (supported by the EC, DG XIII, coordinated in Sweden by TFK) is to develop telematic solutions for the co-ordination of freight delivery in inner-urban areas.

The Swedish section of the project has studied ten fruit and vegetable wholesalers that distribute goods to a large number of stores. Based on this, a co-ordinated freight flow simulation has been created for small companies in a region using computerized route and freight planning systems.

It is hoped that SURFF will contribute to the development of effective and environmentally friendly freight delivery.

Centre of Traffic Engineering

The **Centre for Traffic Engineering and Traffic Simulation, CTR**, (KTH, Department of Infrastructure and Planning, Stockholm) is a national scientific resource in the field of modeling traffic with an emphasis on simulation techniques.

KTH and VTI (the Swedish Road and Transport Research Institute) established CTR in 1995.

CTR aims to coordinate and develop capabilities through new socio-technological possibilities as ITS and new traffic policies, ensuring

- Increased efficiency of road transport systems
- Achievements in traffic safety and quality requirements
- Easy adaptation of the system to meet environmental constraints

CTR conducts research primarily into traffic behavior and driving processes, relevant to the development of road infrastructure and transport telematics.

CTR aims to build and continue to develop research and training to attract research students, researchers and research financiers in

On the CTR home page you can find a list of ongoing projects and published reports.
Home page address:
<http://www.infra.kth.se/ctr>

Simulation is intended to constitute a national scientific resource on a high engineering and traffic modelling emphasized to application of simulation techniques and VTI. CTR has its site at the Department of Infrastructure and Planning, KTH. In and elaborate an adequate capability in the defined area due to new socio-technological possibilities such as ITS, new traffic policy thus ensuring highest possible efficiency of the road transport system, fulfillment of traffic safety and quality demand and a satisfying adaptation of the system to environmental constraints.

The overall objective of the CTR is to create an attractive and a competitive scientific milieu and a Ph.D programme in an international context and to transfer knowledge by education, seminars etc.

Source of funding: Transport and Communication Research Board and National Swedish Road Administration.

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Sweden and internationally. To achieve these goals, CTR identifies research needs, initiates, co-ordi-

nates and carries out research and disseminates knowledge of research results.

Projects and references

PROMETHEUS behind the steering wheel

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Sustainable development and information technology – how can they be united?

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IT and traffic planning – Prestudy

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Transport Telematics: A User-based perspective

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TOSCA Test-site oriented scenario assessment

Project leader: Gunnar Lind
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Assessment of the effects of integrated transport telematics scenarios

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Demand responsive transport with ATT (Advanced Transport Telematics)

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Information technology and drivers' behaviour

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ADEPT II – Automatic debiting and electronic payment for transport II

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Network effects of urban traffic control

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SAVE – System for effective Assessment of the driver state and Vehicle control in Emergency situations

Project leader: Björn Peters
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AC-ASSIST – Anti-collision autonomous support safety and intervention system

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Development and testing of an electronic driving licence

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Projects and references, continued

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NEAN – North European ADS-B network

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MAGNET-B

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SUPRA

Project leader: Åke Gustafsson
Research institute: Swedavia AB
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CASCADE, D23 – Contribution for assessment of common ATM development in Europe

Project leader: Åke Gustafsson
Research institute: Swedavia AB
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MAICA – Modelling and analysis of the impact of changes in ATM

Project leader: Åke Gustafsson
Research institute: Swedavia AB
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EUROBORDER

Project leader: Lars Källström
Research institute: TFK – Institutet för transportforskning
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INTERPORT – Identification technologies for inter-modal port handling support

Project leader: Lars Källström
Research institute: TFK – Institutet för transportforskning
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SURFF – Sustainable urban and regional freight flows

Project leader: Henrik Sörensen
Research institute: TFK – Institutet för transportforskning
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CTR – Centre for traffic engineering and traffic simulation

Project leader: Janne Sandahl
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KFB is also responsible for information and documentation within its areas of responsibility.

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