9. TEST SITE WEST SWEDEN - *ARENA*

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9.1 INTRODUCTION

The Swedish RTI-program, for the time period 1991-94, has a strong direction towards developing and field tests of the RTI-functions/systems included in the program.

The test site named ARENA, with SNRA (Swedish National Road Administration) as leading institution form the base for the program and the field trials. The intention is that the test site should work as an open laboratory for experimenting and evaluation of different RTI-functions and their integration.

The organization of the Swedish RTI-program is running with a program board at the top level consisting of the main sponsors:
- NUTEK; the Swedish National Board for Industrial and Technical Development,
- TFB; the Swedish Transport Reasearch Board,
- SNRA; Swedish National Road Administration
- Televerket; Swedish Telecom
- SAAB
- VOLVO

The aim of the Swedish RTI-program is:

- to demonstrate how the road infrastructure could be improved by use of RTI, and show the benefits for transport economy, road safety and environment.

- to give Swedish actors the opportunities to be in front when implementing of RTI-technolgy is prepared,

- to stimulate product development in minor companies in electronic and supplier industry,

- to cooperate with international partners for wider knowledge, larger markets and shared costs.

The structure of the Swedish RTI-program with the differnt areas of interest is illustrated by the following figure:

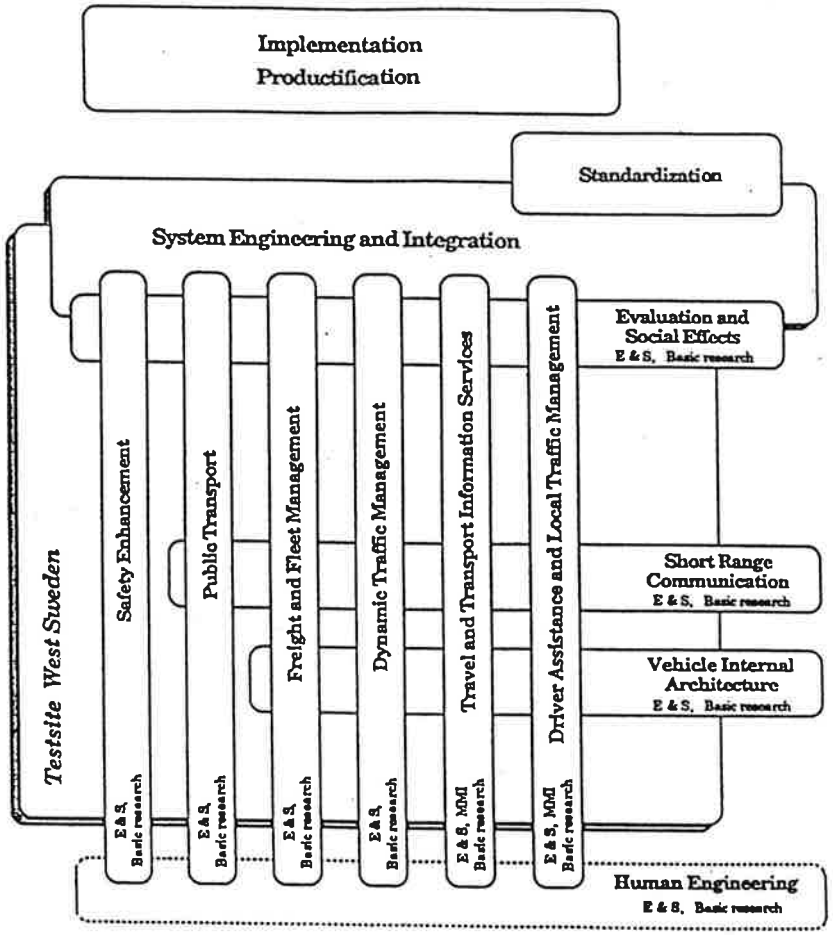

Figure 1: Structure of the Swedish RTI-program 1991-94.

9.2 *ARENA* - TEST SITE WEST SWEDEN

ARENA - Test site West Sweden, is created by the SNRA in the region of Gothenburg. It is a platform for developing and field trials of RTI-functions by cooperation between authorities, industry and other organizations.

The activities are divided in five areas: traffic management, route guidance, traffic safety, production support and economic evaluation.

9.2.1 Aspen Track

Referring to tube DALTM in figure 1, Driver Assitance and Local Traffic Management, in the RTI-program, I am going to present the project "Aspen Track" concerning transmission of road side information to the vehicle.

The partners in this particular project are the City council of Gothenburg, SNRA, Catella Generics, Saab, Volvo and Department of Traffic Planning and Engineering at Lund Institute of Technology, University of Lund.

The aim of this project is to improve the road safety by warning systems in the car in critical situations. To develop, test and evaluate different systems for information of the driver about hazarduos situations.

Along a apprx. 33 km long route in the neighbourhood east of Gothenburg transponders were installed.

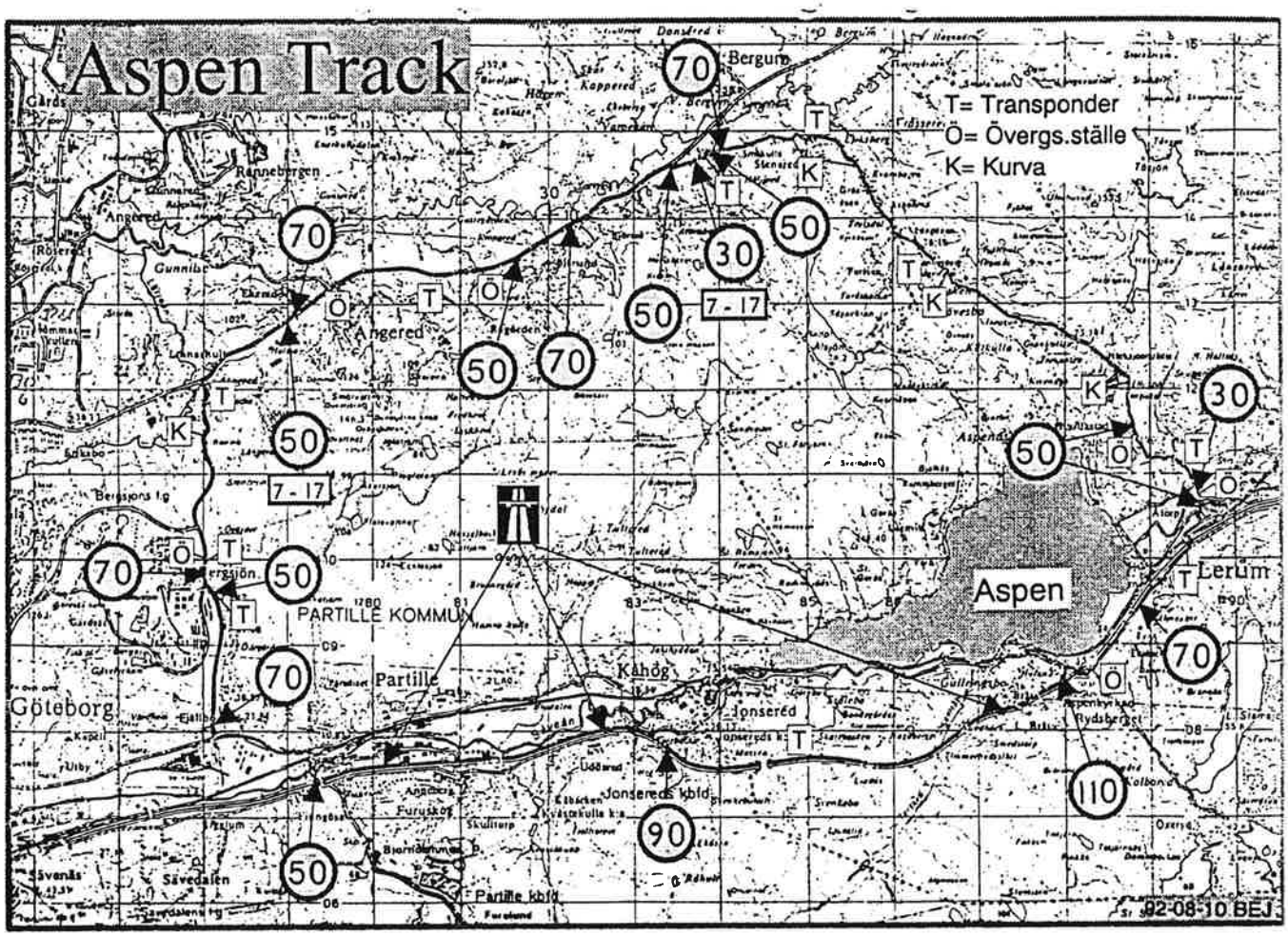

Figure 2: The test route "Aspen Track" with signs and transponder locations.

Via microwaves, using the Compose-system with the frequency 17 GHz, road side information are transmitted to corresponding transponder receivers on the vehicle.

The transmitted information consists of the following:

* Actual speed limits,
* Warnings of pedestrian crossings, and speed recommendation for the particular sites,
* Warnings of dangerous curves, and dito speed recommendation,
* Warning of road work ("Road UP! Men at Work!").

The information to the driver was presented graphically on a display at the dashboard.

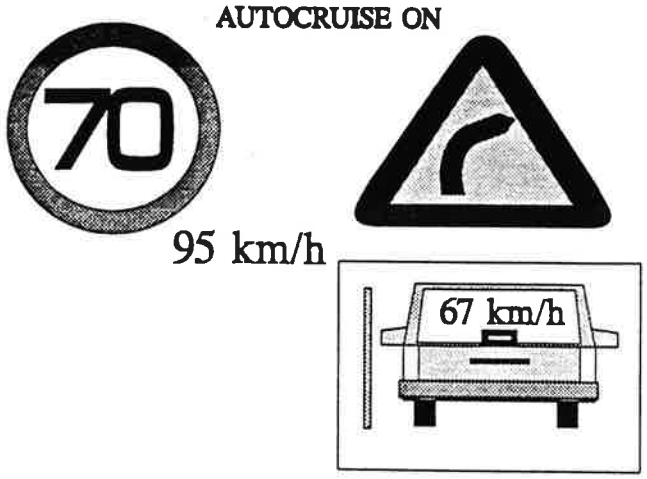

Figure 3: The display design in the Volvo test car.

9.2.2 Procedure

16 persons with different sex and ages, were hired for participation as test drivers in the project. Two equipped cars were used, one Saab and one Volvo. The equipment was the same as the AICC, (Autonomous Intelligent Cruise Control), developed within the Prometheus work (CED 5).

The test drivers started with a ride along the test route with an unequipped car in order to show their "normal driving behaviour". Every ride took about 40 minutes.

The test rides with equipment were carried out a month later. Every test person had to do two test rides. During the first one - called the "informative" - the information signs or messages are visualized for the driver, but the driver can choose if he wants to follow the information or not. The second test-mode was the "assisting or intervening" one. In this case the speed was automatically reduced by the ICC-function to the recommended level at each site as it was decided in advance: either the legal speed limit or a lower one, depending of the situation (e.g. sharp curve, a cross walk, etcetera). At the same time the speed was constantly kept at the legal speed limit on other parts of the route.

The examination methods consist of:

* **Speed logging**, continously carried out for all test rides.

A datalogg was installed in the test cars for registration of time and distance. From the collected data it is possible to calculate speed, accelerations, retardations and stops.

* **Standardized behavioural observations**

A record form was prepared in advance for the observations concerning:

- speed behaviour related to the legal speed limit and for specific situations,
- distance keeping to to vehicle ahead,
- side distance when passing bicyclists or other turnovers
- errors concerning late speed adaption, braking, lane changes, yield obligation, traffic light obedience, use of direction indicators, miscellaneous....
- interactions/conflicts with other road users.

* **Interviews after every test ride**

The interviews aimed to find out the test drivers expectations about the RTI-equipment before they were introduced. Later on after practice and limited experience of the RTI-function the test drivers answering questions about their opinions and experiences of the additional RTI-functions.

* **Work load test** (initiated and analyzed by VTI, Road Research Institute).

9.3 RESULTS

There are still preliminary results available.

9.3.1 Speed logging

From the reference rides, violations against the legal speed limits are frequent at most of the parts along the route.
By using transmitted road side information the speed adaptation can be improved. It is essential to stress that in the informative mode the speed information only is interpreted as a guidance. When using the intervening mode there do not exist any violations to the speed limits, but the speed adaptation at some locations was not acceptable. This was because of the ICC-function that "force" the driver to drive with legal maximum speed as long as possible. Particulary in urban areas or before sharp bends this can be very unsafe.

9.3.2 Behavioural observations

The behavioural observations show results in the same direction.
Behaviour at locations with low intensity of external distraction, like the ride on the motorway and on the rural roads with good standard, results in very few remarks. Only some critical

rear-end situations when the test vehicle is approaching with the choosed speed and the driver is adjusting the speed to late have been registered.

Critical remarks became more frequent at parts of the route in urban areas, were unprotected road users and interactions with other road users have to be considered.
Even at those locations with diffuclt curves critical remarks because of late adjustment of the speed are frequent.

9.3.3 Interviews

The expectation for assisting functions like the one we have used in this project is very high among the test drivers.

The informative mode, which only gives information and recommandations, was accepted as a help for reminding of what rules, in particular: speed limit, were to be respected.
By using the intervening mode with assistance of the ICC-function the test drivers were less free to influence the speed choice. Nevertheless they were very understanding for this new type of driving task. Only one of the test persons (1/15) took a direct negative attitude towards the function. The rest of the group accepted this way of assistance more or less. Arguments often used were calmness, simplicity,legality.
A lot of other useful comments came out from the interviews, in particular that drivers felt comfortable with the assistance in certain situations like at unknown roads where the conditions are unfamiliar, but they also felt unsatisfied with the speed keeping function in certain other situations like towards sharp bends and in urban areas.

9.4 CONCLUSION

The preliminary conclusions are based on the fact that three different methods of evaluation, speed logging, behavioural observations and interviews, point in the same direction.
However, it should be stressed that the project has been carried out with very limited resources. Only a small and very homogenous test group could be studied, new unfamiliar functions with unknown reliability were tested and the tests were carried out in a very limited time.

These were our main conclusions under the prevailing conditions:

* It is possible to influence the speed adaption by using this kind of RTI-equipment which transmitts road side information to the vehicle.

* If the speed adaption can be improved at some critical locations like in urban areas the general road safety could be improved, as well.

* Our test results indicate various "effects" depending of road- standard or/and type.

* A high degree of acceptance of the new RTI-function was registered within the test group.

* Some minor but important changes of the function design will probably improve the possibilities to influence the traffic safety effects.

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