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APPLICATION OF INFORMATICS IN ROAD SAFETY

Transmitted by the Government of the Netherlands

Note: Attached is a report on an experiment being carried out in the Netherlands on Intelligent Speed Adaptation (ISA). It has been reproduced as received with minor editorial changes.

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INTELLIGENT SPEED ADAPTATION (ISA) IN THE NETHERLANDS

I. Introduction

1. Seven years of active speed policy in the Netherlands has only led to the conclusion that the traditional approach towards speeding has its limits. The percentages of violation of several speed limits are still significant, ranging between 30 and over 50%. High vehicle speeds have negative impacts on safety, energy consumption and the environment. A study into the costs and benefits of lowering speeds of cars in the Netherlands showed some remarkable results. The upholding of the present speed limits would lead to a reduction of the number of hospital admissions by 15% and the number of fatalities by 21%, fuel consumption and carbon dioxide emissions would decrease by 11% and the emission of nitrogen oxides by 11%. These positive effects would lead to societal benefits, with a total value of 520 million guilders per year (236 million Euros) in the Netherlands.

2. Several ways of enforcing speed limits are possible. In a study executed in 1996 three different scenarios were assessed. They were:

(i) Completely automated control and upholding on all road types, except for the lowest order of roads (on these roads the "Sustainable Safe" approach);

(ii) Speed constraint: according to the Sustainable Safe approach on all roads and restriction of the allowed specific engine capacity.

(iii) Intelligent Car: variable speed limiter in all cars on all types of roads.

3. This study showed that capitalized over 35 years, the scenario with speed limiters was the most effective and economically feasible (costs about 0.5 to 1.5 billion guilders = 0.22 to 0.66 billion ECU per year).

4. Based on arguments like those given above and the fact that car telematics seemed to be developing rather quickly, ISA was from 1995 an option that was looked into by the Dutch Government. In 1997 the Dutch Parliament asked whether (judging from the first experiments with ISA in Sweden), ISA was a feasible option for the Netherlands. The Minister responsible promised to look into the possibilities and reserved a budget for an experiment. Now, in 1999, after several years of preparation, the Dutch Government will start a small scale field trial with Intelligent Speed Adaptation. This report will describe the background of this study, the main research questions as well as the approach to executing the study. Although it is expected that ISA can contribute to a better environment (due to less emissions and improved energy efficiency) as well as increased capacity of existing roads, the main goal of the field trial is to evaluate the effect ISA can have on safety.

II. What is ISA?

5. ISA is based on signals given by beacons on the road side or a GPS based system within the car. These signals are received in the car and (via an interface) converted into an action aimed at the gas pedal leading to a regulation of the speed of the car in accordance with a prior adjusted speed limit. Interfaces that work by controlling the brakes are not yet reliable. ISA has three options:

- A closed variant (enforced speed adaptation): in this variant the system directly interferes with the gas supply, making it impossible to exceed a certain speed limit. The action cannot be overruled by the driver.

- A half-open variant (intelligent gas pedal); either via an electric motor with control feedback to the accelerator or by an additional spring (valve), the force needed to exceed the speed limit is increased. Exceeding the speed limit will require more of a person's strength, which soon gets tiresome. The action of the driver is being dominated.

- An open variant (information to driver): this system does not influence the accelerator but gives signals to the driver when entering an area with a speed limit. Communication takes place via an illuminated display (a series of light-emitting diodes alongside the speedometer displaying the limit), via an audio message (an interrupted alarm signal changing into a continuous signal at continued excess speed) or via a combination of the above. This action programme can be ignored, or even simply sabotaged.

III. Set-up of the field trial

6. Within the period of September 1999 till September 2000, 20 cars driving in the district of Reeshof in Tilburg will be equipped with an externally adjustable speed limiter. Residents of the subdistrict of Campenhoef will be selected to use the cars during a period of 2 to 4 months. Within Campenhoef itself the existing speed limits are 30 and 15 km/h. The roads leading to Campenhoef have speed limits of 50 and 80 km/h. The closed variant of ISA will be tested.

IV. Why Tilburg ?

7. In 1997 the Transport Research Centre executed a feasibility study into the possibilities of a pilot project in the municipality of Tilburg applying intelligent speed adaptation in cars in a newly to be built suburb. ISA is a technical application within the vehicle that regulates the speed of the vehicle via signals outside the car and maximizes it on the actual valid speed limit. The study resulted in a general description of a feasible acknowledge project. A complimentary contra-expertise, executed by Bureau Hofstra traffic advisers, led to a segmentation of the original proposal. As a first phase in this segmented approach a small scale field trial or demonstration project was proposed, constituting the technical development of ISA from prototype to a full series of vehicles that are approved by the Department of Vehicle Technology and Information (RDW) and the setting up of an experiment in a restricted area, within an existing district of Tilburg, using approximately 20 cars. The primary goal, in addition to showing the operational feasibility of the system, is the further testing and improvement of the ISA system based on the experiences of drivers. A first indication of public acceptance is also necessary. This project description aims at the execution of the small scale demonstration project with approximately 20 cars in an existing district in Tilburg.

V. Goals of the demonstration project

- The main goal of this project is to demonstrate in a real life situation that ISA is a feasible option for speed control in different ways:

    1. Technical operationalization of the ISA concept as an external driver variable speed limiter.

2. Feasible for society in terms of acceptance and attitudes of people; survey results and small scale field tests in Sweden show that the societal acceptance of ISA systems in residential areas is considerable. The Dutch Minister wants to assess these data in the Dutch situation.

- Obtaining preliminary data on the effects of ISA on driving behaviour (and therefore the effects on traffic safety and the environment).

VI. European Framework

8. Within the European Framework intensive cooperation both on a policy as well as on a working level exists. In the countries that see ISA as a very important possibility in road safety programmes there are regular meetings to address the general aspects of ISA pilots as well as the outcome of desk research and problems encountered during the execution of pilots. Sweden is the most active country with regard to ISA; at the moment they plan to install different kinds of ISA equipment in several thousand cars. However, in order to reach European integration, it is important that cultural differences between countries are looked into as much as possible and that there are experiences with the technology throughout Europe. In a sense the demonstration project in Tilburg is on a very small scale compared to the ones which have taken place in Sweden. Its additional value lies in two aspects:

(i) The fact that it takes place outside Sweden and is executed by Dutch firms. This is significant in that the cultural differences of the public and test drivers can be looked into. Also the fact that the technology used to equip the car may differ from country to country, but it shows that all countries can come up with solutions for the technological challenge.

(ii) The fact that the variant to be tested in the Netherlands is the closed variant. This alternative has not been tested in the Swedish context and also gives information on the acceptance of this most far reaching alternative with respect to freedom of choice.

VII. Project approach for the demonstration project of ISA Tilburg

9. The overall management of the demonstration project is in the hands of the Transport Research Centre. In order to ensure an accurate and workable layout of the project, four different elements were distinguished for which contractors were selected, using an open European selection procedure. These four elements are:

- The technical part, including all technology within and possibly outside the car so that the cars involved in the experiment cannot exceed the existing speed limits. The continuous functioning of the ISA system is the responsibility of the contractor of this pilot element.
- The research into the impacts of the technical system on human behaviour, expected positive and negative effects, functioning (ergonomics) of the system, contribution to safety (or feeling of safety), etc., contracting of participants and control group. The long-term effects of driving an ISA equipped car are also the subject of investigation.
- The communication activities around and as a consequence of the demonstration. It is expected that the project will draw attention on different levels for diverse reasons (use of speed limiters within cars, use of modern technological innovations, new communication media, “big brother is watching you” aspects, etc). Contributing parties each have their own reasons for joining (Tilburg for example because of the possibility of hosting a large scale ISA experiment, the Ministry of Transport, Public Works and Water Management looking at ISA as one of the possibilities of the intelligent car).
- The project manager on the site (Tilburg) who coordinates the above-mentioned elements. This includes activities such as following the experiment, taking care that drivers have their ISA cars

in time, organization of legal and financial aspects, networking with drivers and contractors, preventing people from being called ten times a day (to join a control group for research, join a symposium etc.) A part of the (day-to-day) communication will take place with this person. The project manager is the coordinator for all day-to-day items regarding the demonstration project.

VIII. End products of the demonstration project

- Description of the operational ISA system as applied in the demonstration project.
- Description of the design and results of the evaluation research and experiments carried out within the framework of the demonstration project.
- Description of the communication activities aimed at enhancing the knowledge of and about ISA as well as developing societal acceptance of the ISA concept.
- Recommendations for future projects, with emphasis on implications for the European scope and the Dutch input.
- Feasibility study into the technical, financial and societal aspects of the large scale introduction of the ISA system on the basis of this demonstration project.

IX. Project organization

10. The following project organization has been created to guide the execution of the demonstration project. It is a combination of policy oriented and official/expert elements.

11. The general guidance for the project is the task of a Steering Committee. In this Committee members of the Ministry of Transport, Public Works and Water Management, the Directorate General for Passenger Transport, Traffic Safety and Vehicle Directorate and the Municipality of Tilburg are represented at the policy level. Coordination at the managerial level will take place. The project leader of the Transport Research Centre will participate in the Steering Committee as an advisor. The Steering Committee will determine the constraints with respect to time, budget and quality for the execution of the project. The organization and meetings of the Committee are the responsibility of the Traffic Safety and Vehicle Directorate (DGP-VV).

12. A Societal Interest Group has been formed to liaise with relevant societal interest groups. They will be invited by the Steering Committee approximately 3 to 4 times a year. In this group, representatives of automobile clubs, road safety associations, the police and other organisations are taking part. The purpose of the meetings is to keep these groups informed and have the advantage of direct contact if issues need to be discussed.

13. Coordination and refinement of different activities will take place under the supervision of the project team and the guidance of the project leader. There is a project group in which all contractors will coordinate their different activities and general decisions on the planning and implementation of the project. As well as this project group several expert working groups will supervise the execution of the different project elements; the technical, research and communication activities.

X. Technical approach

14. At the end of the European selection procedure the Dutch firm Nederland Haarlem was chosen as the contractor for the technical execution. They offered a system based on differential GPS and an on-board unit as well as a speed limiter which has been used in several vehicles all over Europe. The position-finding is done every second and speed transitions are pre-programmed using coordinate polygons. All system components used are already tested and approved for EMC and safety standards. The accuracy of speeds they offer is 1.5 km/h, meaning that different cars will not differ by more than

3 km/h. They also offer a time-dependent approach for a certain school area in the suburb. Here speeds will be lowered during the entrance and outgoing periods of the schools. The speed limits to be upheld are 80, 50, 30 and 15 km/h. The cars will be submitted to three different tests before they are handed over to the test driver. The first test will be a laboratory test mainly focused on EMC standards. The second test will be a test which is focused on safety regulations (does the car function properly in a situation with other cars and does the emergency button function according to safety regulations). In this test the performance of the cars is assessed with respect to functional specifications. The third test, in the suburb of Campenhoef itself checks whether the combination of differential GPS and the speed limiter works in the suburb of Campenhoef. Only when all three tests are completed satisfactorily will the cars will be handed over to the drivers. During the testing period a data logger will log the speeds driven inside and outside the area, the passing of speed limits, the time of driving, the period of driving and other data. In case of no response to the speed threshold an emergency call will be made to the Central Processing Unit and proper actions will be taken to solve the problem. The cars used are leased and handed over to the test drivers for 2-3 months.

15. As mentioned above, the technical system chosen is based on components that are already used. The research and development will therefore be limited to coordination of the different components. Another development area is the adjustment of the chosen speed limiter to uphold four different speeds. The fact that the navigation system is based on differential GPS and polygons makes it very flexible. If it is not possible to get enough test drivers in Campenhoef it is relatively easy to acquire test drivers in a neighbouring suburb.

XI. Communication

16. The demonstration project in Tilburg is expected to draw quite a lot of attention. The professional approach towards communication around this project is expected to be very beneficial. At the beginning of the preparatory round government institutions involved stated their target groups and communication goals to be reached through this field trial. Target groups are the test drivers, control group members, inhabitants of the suburbs of Campenhoef and Reeshof, traffic participants in the suburb, inhabitants of Tilburg and the general public. Communication goals stated range from acquiring the right amount and "type" of test drivers, Tilburg as an innovative municipality, to the Ministry of Transport, Public Works and Water Management taking public involvement seriously. The central idea behind the communication approach is that the persons involved in the field trial will determine whether or not ISA is a feasible approach to enhancing road safety.

XII. Conclusions

17. The approach to the field trial of ISA in the Netherlands, as described in this paper, should guarantee the success of the experiment. It is important to acknowledge that success is not defined as the acceptance of ISA by the Dutch public. The field trial will have succeeded if the feasibility of ISA in all its aspects can be assessed. The evaluation of ISA by test drivers and other citizens should be the basis.

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