ISA
INTELLIGENT
SPEED
ADAPTATION
LARGE-SCALE TRIAL

The Swedish government has decided that the Swedish National Road Administration (SNRA) can run a large-scale trial involving Intelligent Speed Adaptation (ISA) in urban areas. This trial will be based on the experience acquired from previous smaller-scale trials.

Several thousand cars will be equipped with smart, supporting, voluntary systems to help motorists keep to the speed limits. The SNRA will be investing a total of SEK 75 million between 1999 and 2001. This trial will be conducted in collaboration with four municipalities and will aim to increase our knowledge of:

- motorists’ use and attitudes
- the traffic safety and environmental effects
- the integration of these systems in cars
- the prerequisites for the large-scale use of road informatics

ISA

ISA stands for Intelligent Speed Adaptation.

THE “VISION ZERO” IS BASED ON THE ASSUMPTION THAT EVERYONE SOMETIMES MAKES MISTAKES

In the autumn of 1997, the Swedish parliament approved the government proposal that all traffic safety work should be based on the “Vision Zero”. This means that no one should need to be killed or seriously injured on the roads — a reversal in the trend in traffic safety programmes. In the past, these programmes focused on dealing with problems when they occur and individual road users were given the greatest responsibility for safety. It is now a question of preventing accidents and injuries and of everyone joining forces to create a safer traffic environment.

The most important overall change is that the human factor alone should not be blamed for causing an accident. We should instead ask ourselves which parts of the traffic system — the driver, the vehicle and the road — have failed.

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The human factor alone should not be blamed for causing an accident. We should instead ask ourselves where the traffic system has failed.
NEW TECHNOLOGY PROVIDES ASSISTANCE

It is difficult to keep to the speed limit, even if we “know” that we should not drive too quickly. Studies reveal that virtually everyone feels that it is important to keep to the speed limit. Even so, more than half the people interviewed stated that they had frequently or fairly frequently driven too fast during the past year. The link between the danger to which we are exposing ourselves and our environment is not clear-cut. So we need help to enable us to understand. This help can include different types of voluntary technical system which enable us to maintain the correct speed.

CARS HAVE BEEN AROUND FOR 100 YEARS — PRECIPICES SINCE TIME IMMEMORIAL

Human beings are not designed to drive quickly. When man was created and developed, the opportunity did not exist. As a result, we have no innate fear of high speed. Precipices, on the other hand, have always existed and we are naturally afraid of great heights. These two factors are, in fact, the same thing. If you fall out of a window on the top floor of a three-storey building, you will be travelling at a speed of 50 km/h when you hit the ground. Everybody knows that it is dangerous to lean out of windows. The same instinctive protection is lacking in cars.

SPEED IS DANGEROUS

The car is an important part of our society. It gives us freedom. At the same time, many accidents occur in traffic. Speed is one of the most important factors when it comes to determining the severity of the results of a traffic accident. Seventy pedestrians in 100 die if they are hit by a car travelling at 50 km/h at the moment of collision. If the car is travelling at 30 km/h at the moment of collision, 90 of 100 survive instead. So it is even more important to stay within the speed limit in urban areas, where cars, buses and trucks have to interact with pedestrians and cyclists.

![Risk of fatalities among pedestrians in collisions with cars.](chart.png)

Source: Waltz et al, 1983
**FOUR TRIAL AREAS**

Borlänge, Lidköping, Lund and Umeå are the trial cities and are responsible for running the trial in the individual areas. The SNRA is co-ordinating the project at national level, in the form of project management, technical support and evaluation co-ordination.

Different groups of road users are included in the trials. In overall terms, private individuals account for the largest group, but professional road users, working for both private businesses and public authorities, including public transport vehicles, also account for a significant percentage.

**DIFFERENT SYSTEMS TESTED**

Different systems and different technical solutions are being tested in the four trial areas. All these systems are first-generation prototypes.

If the ISA system is to know how quickly a car is travelling, all the test vehicles need a sensor in the cruise control system. In practical terms, this means that vehicles from the 1989 model year and later can participate in the trials.

**INFORMATIVE ISA SYSTEMS**

A box with a warning function is attached to the dashboard. When the driver exceeds the speed limit, a lamp flashes and a sound signal is heard. This system is being tested by both private motorists and professional drivers in Umeå, Borlänge and Lidköping. In Borlänge and Lidköping, there is also a display which shows the current speed limit in the test area.

**ACTIVELY SUPPORTING ISA SYSTEMS**

This system is also known as the "active accelerator". When the driver attempts to exceed the maximum permissible speed, slight resistance in the accelerator is activated. The driver is informed without needing to take his/her eyes off the road to look at the speedometer. If necessary, the driver can disconnect the system by depressing the accelerator somewhat harder, otherwise known as a kick-down function. This system is being tested by both private motorists and professional drivers in Lidköping and Lund.

**ISA SYSTEMS FOR QUALITY ASSURANCE**

Quality assurance systems will be tested on transport purchased municipally, such as school taxis and transport for the disabled, with the aim of providing a basis for assuring the quality of traffic safety. The test vehicles will be equipped with a unit which registers and stores any speed violations, if the driver fails to reduce speed in spite of warnings from flashing lamps and sound signals over a period of 10-15 seconds. The transport purchaser will then receive a "receipt" proving that the carrier has complied with the agreement to maintain speed limits. This system is being tested in Borlänge.
**EVALUATION**

The project will be evaluated from four angles. What does the user think? How can the technology be integrated with the driver? What are the effects on safety and the environment? What is the general attitude to traffic safety? Each municipality will conduct its own local evaluation. All the evaluations will be co-ordinated nationally.

In principle, the evaluations will be based on comparative measurements, before, during and after the introduction of ISA systems. There are relatively large differences in the design of the trial in the four trial areas and this will be taken into account when planning the field measurements and comparing the evaluation results.

**GPS OR TERRESTRIAL TRANSMITTERS**

Vehicles need to know their position and the speed limits which apply there. Two different technologies are being tested to achieve this GPS with digital maps and roadside transmitters.

**GPS AND DIGITAL MAPS**

In Lund, Lidköping and Borlänge, a GPS receiver will be fitted in the test vehicle. The receiver identifies the position of the vehicle. The vehicle does not transmit a signal of its own and cannot therefore be localised. GPS stands for Global Positioning System and was originally developed for navigation at sea and in the air. The system is satellite based and, using an additional function, DGPS, it has a precision of up to two metres. To supplement the GPS technology, the vehicle needs to be equipped with a digital map of the test area, which includes the current speed limits.

**ROADSIDE TRANSMITTERS**

In Umeå, transmitters along the sides of the road, next to speed signs, are being tested. These transmitters send a signal to the test vehicles informing them that they are in the test area and specifying the speed limits which apply there.

1. In Lund, Lidköping and Borlänge, the vehicles are aware of their position thanks to GPS technology combined with a digital map. This map is downloaded into the car using a CD-ROM, for example.

2. In Umeå, the speed limits will be communicated by roadside transmitters to a receiver in the vehicle.

What does the user think?

Is there commercial potential for future large-scale ISA projects? Two important questions which will be answered.

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CURRENT SYSTEMS PROBLEMATIC

Twenty years ago, bumps began to be built into roads and streets to reduce speed. Other physical means of reducing speed include curves, corners, portals, indentations and grooves. They reduce speed, but they also result in inconvenience. Accessibility for public transport and commercial traffic is reduced. Rescue and service vehicles have more difficulty getting through. Road maintenance, and snow clearance in particular, is more difficult and more expensive. The incorporation of these speed-reducing measures also costs a fair amount in terms of investment and maintenance.

Current speed limits are not sensitive to the prevailing conditions. The speed signs do not take account of whether it is slippery or whether the traffic is heavy, for example. In practice, these factors often mean that the speed should be lower than it is in dry conditions when there is only light traffic.

FUTURE SYSTEMS INTELLIGENT

Using Intelligent Speed Adaptation (ISA), the current traditional systems can be supplemented with smart technical systems. This will help us motorists reach our destinations smoothly, safely and conveniently and will make life more secure for other road users at the same time. Physical speed obstacles can be replaced with electronic “bumps” and the permitted speed can be easily adapted to match the prevailing conditions.

At the present time, we are living in a society in which stress is part of most people’s everyday lives. When you get behind the wheel, it ought to be the perfect opportunity to relax. However, it is frequently exactly the opposite. ISA will help us motorists to reduce the tempo and regard car transport as a break from stress. The time it takes to travel from A to B will be more uniform, as the traffic will flow more smoothly. This will enable us to plan our travelling times more effectively.

On a normal car journey in an urban area, it is often only possible to save seconds or perhaps a minute or two, if you drive too quickly. The risk to you and others, the stress, the cost, including the risk of fines, are not proportional to the time savings.
INTERNATIONAL INTEREST

Sweden is one of the world leaders when it comes to ISA. Research in this area has been in progress in Lund since the start of the 1980s. In the past, only small-scale trials with ISA have been conducted and this large-scale trial is therefore being followed with anticipation by traffic researchers from all over the world.

In addition to Sweden, the Netherlands and the UK are the countries which have made the most progress in this area. In 1999, trials involving a small number of cars equipped with ISA systems will begin in these two countries.

To create the commercial potential for ISA, the project must be accepted internationally. Information and experience is regularly exchanged in international network groups. Discussions about incorporating parts of this large-scale trial in an EU project are also in progress.

LUXURY GERMAN CARS WITH ISA AS STANDARD

Some 2,000 Mercedes cars equipped with some form of ISA system are already operating on the roads of Sweden. This system is standard on Mercedes models with automatic gearboxes and enables the driver, if he/she so wishes, to select the maximum speed in a 30 km/h area, for example, via a display. Mercedes says that it wants to make it easier for drivers to keep to the statutory speed. It is otherwise easy in today’s modern, quiet cars to drive too fast without realising.
QUESTIONS AND ANSWERS ABOUT ISA

WHAT DOES ISA STAND FOR?
This is an international acronym and stands for Intelligent Speed Adaptation.

WHAT IS THE AIM OF THESE LARGE-SCALE TRIALS?
The trials are designed to increase our knowledge of motorists’ use and attitudes, the traffic safety and environmental effects, the best way of integrating the systems in cars and the way road informatics functions on a large scale.

WHY ISA IN THE FIRST PLACE?
We know that there is a very clear connection between speed and the severity of a traffic accident. This is particularly clear in urban areas, where cars interact with pedestrians and cyclists. The most vulnerable unprotected road users are children. It is hoped that speed adaptation systems will help drivers keep to the speed limits and thereby reduce the risk of serious accidents. Uniform speeds are also good for the environment.

ISN’T ISA SIMPLY ANOTHER STEP TOWARDS A VULNERABLE TECHNOLOGICAL SOCIETY?
The car is a good example of what is called a technological society. In the environment of the car, we human beings are vulnerable. If we can use technology to reduce the number of people who are injured and killed in the traffic and reduce the load on the environment at the same time, this can only be regarded as beneficial. The technology we are using is not particularly sophisticated or new. What is new is the way it is being applied.

WHY PRIMARILY ON ROADS WITH A 30 OR 50 KM/H SPEED LIMIT?
These trials will be conducted in inner-city areas, where the traffic is heavy and pedestrians, cyclists and motorists interact. An unprotected road user who is involved in a collision with a car travelling at more than 50 km/h has virtually no chance of surviving. Under 50 km/h, the chances improve significantly. This explains why we have decided to start with this part of the road network. In the future, speed adaptation may be relevant on roads with higher speed limits, if drivers feel that it offers good support. Several road sections with higher permissible speeds are, in fact, already being included in this trial.

CAN THE GPS RECEIVER BE USED AS AN ALARM IN AN ACCIDENT?
No. As the test vehicles do not transmit a signal of their own, they cannot be localised. The equipment that is installed only informs the test vehicle of its position, at a specific time, and the speed limit that applies there.

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