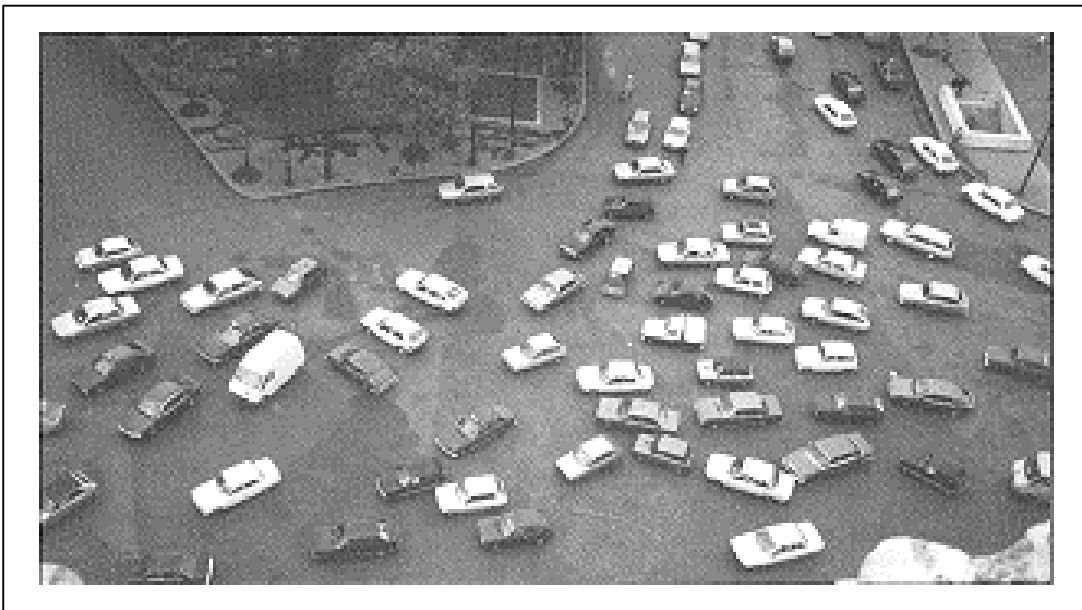


# The Swedish Traffic Conflict Technique

The Department of Technology and Society (former Department of Traffic Planning and Engineering) at Lund University in Sweden was awarded the Volvo Traffic Safety Award 1991 for its work with the Conflict Technique. The method is used to chart the safety in traffic. It has been refined through the years and its applicability is not only in motorised countries but even in developing countries world-wide.



## The Conflict Technique Won the Prize!

*The Conflict Technique has developed during a twenty-year period at the Department of Technology and Society (former Department of Traffic Planning and Engineering), Lund University in Sweden. In combination with other evaluation it informs about the traffic safety, primarily in urban areas. The technique has been refined through the years and the cross-scientific composition of the research team is important for the method's development.. "Today we know more about the road user behaviour, says Professor Christer Hydén, head of the research team. When modifying the traffic layout, it is important to find holistic solutions that really give the desired changes in behaviour. The human being is the most important component".*

Our traffic environment is getting more and more complex. The number of cars increases. Wider roads and better technology also mean higher speeds. Motorists want short travel times. At the same time, vulnerable road users such as bicyclists, pedestrians, and elderly drivers, demand increased safety as well as less obstruction. How are these demands to be met? How can the traffic environment be designed to make everybody happy? "It is important that we get a living traffic environment where road users can move comfortably without fear, says Professor Hydén. We must therefore adapt the layout so that traffic moves continuously, even though car speeds sometimes may have to be lowered. Today, motorists are often allowed to drive much too fast."

### **To What Use Can the Conflict Technique be put?**

In the daily work of improving the traffic environment, it is important to pin point which places and/or situations are dangerous, and why they are dangerous; as well as assessing whether a modification is beneficial. "The Conflict Technique enables us to study 'hazards' in traffic in an uncomplicated way. It used to be the number of reported accidents at a site that decided whether it should be rebuilt or not. Now, we can judge whether the site is dangerous after only three to five days of conflict studies, and if so, propose suitable countermeasures. We can also make an immediate follow up after the implementation of a countermeasure. Did it have the desired effect? Our studies have demonstrated that conflicts resemble accidents. The process of a serious conflict is almost identical to that of a serious accident, with the exception of collisions occurring less frequently and that no one is injured," says Professor Hydén.

### **The Conflict Technique is easy to use**

It does not demand any complicated equipment, and already after a week's training, observers are ready to carry out studies. The simplicity of the method also makes it applicable in the increasingly important safety work of the third world, where technical equipment is often lacking.

"The Conflict Technique works best in combination with other methods, for example, studies of behaviour, accident analyses, studies of interactions, and interviews with road users," continues Professor Hydén. "That is important to remember."

## Practical Applications

The conflict technique is used foremost in urban areas. Over the years, problems in many different types of environments have been addressed. This has led to increased knowledge.

"We have used the same method, the conflict technique, for studying sites with traffic signals, roundabouts, speed humps, etcetera. We have been aided by several local authorities, rebuilding intersections or road sections, enabling us to study them before and after the modification," continues Professor Hydén. "This is of great importance, since many road users have a tendency to modify their behaviour when a layout is changed. This can mean that all or part of the possible safety gain is eliminated."

A major traffic safety project was carried out for seven years in Växjö. The project was started with an evaluation of the traffic safety situation for the whole town. The manner in which traffic related issues are organised was also reviewed. A number of changes in the road network were carried out based on the evaluation, e.g. achieving lower speeds and reducing waiting times for unprotected road users. These changes have later been evaluated, in turn.

"This is our most important work," says Professor Hydén. "In Växjö, the studies covered changes affecting most of the street network. This enabled us to examine the whole town, not only a few isolated intersections. Since the experiment lasted only six months, it was necessary to use the conflict technique as primary indicator of safety changes."

## Technique and Research

The conflict technique is a measuring method, and important linchpin in the group's work. Here, safety and risks are not only described in mathematical terms, when studying traffic safety, it is just as important to obtain knowledge concerning human behaviour. Within the group, sociologists and psychologists work side by side with engineers.

"We want to achieve real changes in road user behaviour. Therefore, we have also focused on behavioural theories. These theories try to answer how we react in different circumstances. We humans do not always act in the same way," argues Professor Hydén. "One example is the wider the road, the faster many drivers drive. They feel safer. But, the intention of building the wide road was originally to enable swerving around sudden obstacles. However, it is often better that the road users do not feel so safe that they always think that there will be ample margins," concludes Professor Hydén.

## The Conflict Technique in the Future

The development of the conflict technique and the traffic safety theories continue. The multidisciplinary approach influences this work. The conflict technique will also have a front line position in the future, practically as well as theoretically. "Future development of the method will include the task of applying automatic image processing in the phase of detecting safety related events. This will enable studies covering longer time periods, and different types of locations," says Professor Hydén. "Today, most studies cover only intersections. The technique is only occasionally suited for use at rural sites." He continues: "When it comes to theory in traffic safety research, there

is a lot more to be developed. Fully functional theories will probably not be evolved for many years. But any contribution is beneficial. Already today, several theories have been developed. We hope to be able to test these with the help of the conflict technique among other methods.”

### **A Synopsis of the Development of the Conflict Technique**

The technique was ‘invented’ by General Motors in the US. The car manufacturer wanted to use the technique for evaluating details of vehicle design’s influence on risks.

The development at the Department in Lund started in the beginning of the 1970’s. The first report on the subject was published in 1976.

During the 1980’s a large number of studies were carried out to test, for example, its reliability and validity.

It has been widely used in traffic research since the end of the 1970’s.

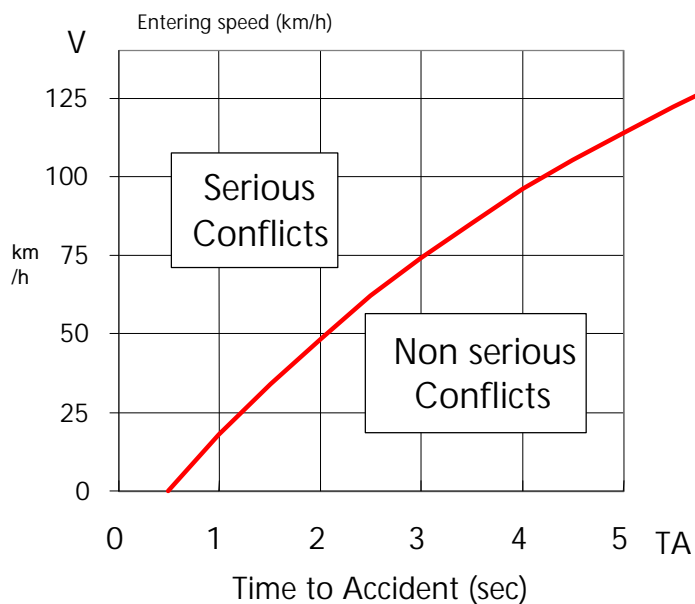
# What is a conflict?

## Conflicts are Undesired Phenomena

Serious conflicts are in the same way as traffic accidents, the result of a breakdown in the interaction between the road user, environment and vehicle. A serious conflict is characterised by the fact that no one voluntarily gets involved in such a situation. The necessary evasive action is usually braking, but may also be swerving or acceleration, or a combination of these.

Since the similarity between accidents and serious conflicts is striking, accidents can be avoided by circumventing conflicts.

## The border between Serious and Non-serious Conflict



## Definition of a Serious Conflict

**TA = Time to Accident**

The time that is remaining from when the evasive action is taken until the collision would have occurred *if* the road users had continued with unchanged speeds and directions.

The TA value can be calculated based on the estimates of distances  $d$  and speed  $v$ .

$d$  = Distance to the potential point of collision

$v$  = Speed when the evasive action is taken

## The Conflict Technique in Practice

*Three to five days of study is required in order to carry out a traffic safety analysis based on the conflict technique. The studies are carried out by 'human observers' specially trained for the task. Most studies encompass urban intersections, but rural sites have also been studied.*

The task of the observer is to detect and record the conflicts, as well as assess distance and speed. It is also important to distinguish between different severity levels of the conflicts. The equipment is uncomplicated: A set of recording sheets and a pencil, plus appropriate clothing. The observations are usually carried out in six or seven one-hour-stretches per day. It is also common to make simultaneous video recordings, to assist future analysis. Video can also be used for training purposes.

### Recording sheet

The recording sheet covers information significant for the evaluation, such as time, location, weather conditions, road user category, etc. A conflict is described in a number of ways when recorded. A simplistic sketch shows the situation, secondary road users and other causation elements; a narrative describes the occurrence. Important details may be age and gender of the parties, as well as the layout of the intersection.

### Training

Most observers have been trained in Lund at the Department of Technology and Society. On request, the training crew also goes to other places in or outside Sweden. Training takes one week, and about twelve people can be trained simultaneously as a group. The crew consists of three men teaching theory, background and practical skills to the future observers. These practical parts include appraisal of distance and speed, instruction from video tapes, and conflict recording with simultaneous video recordings in real traffic. A final exam is inserted on request.

If you are interested in being trained, contact someone at the Department of Technology and Society at Lund University, Sweden

## Traffic Safety Analyses Based on Conflicts

*The conflict technique is used for describing the traffic safety situation. Used together with traffic volume counts, one can get a good picture of how great the risk is that an accident will occur. Conflicts also show the nature of the accidents.*

The traffic safety situation at a site can be described in many ways. For example, it can be characterised by the number of accidents that occur or by the risk of meeting with an accident. There are many reasons why the number of accidents is not a good gauge of the safety situation. It

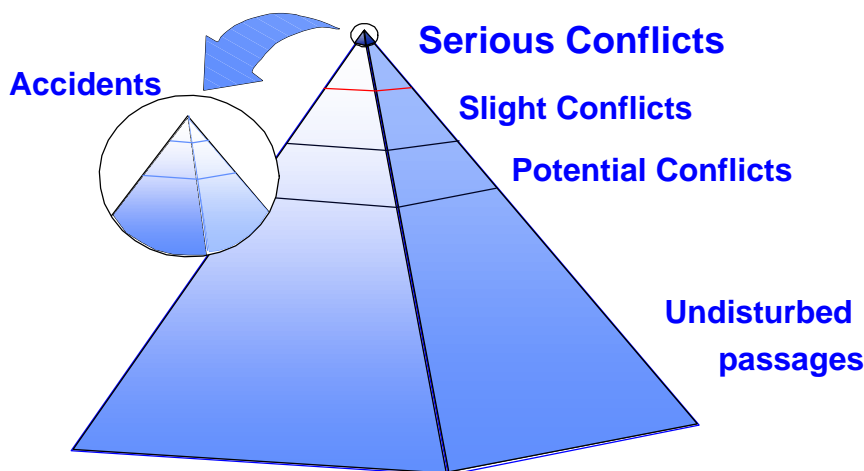
has therefore become increasingly important to measure the risk of meeting with an accident. However, risk is not an unambiguous term. Many types of risk measures can be produced, such as the risk for an individual of meeting with an accident, or the risk that passing another road user will generate an accident. Which type of risk measure is most appropriate depends on which type of question is to be answered.

## The Conflict Technique Gives Us Answers

There are between 3,000 and 40,000 conflicts for each injury accident reported by the police. This ratio depends on type of conflict, and the severity of the conflict.

The random variation is less of a problem, as the number of conflicts based on a few days' study outnumbers the number of accidents over several years. It has therefore been demonstrated that conflict studies give a better estimate of the average number of accidents than accident statistics. This means that 3 days of observations already give (normally) better estimates than waiting for three years of accident data.

Estimating the expected number of accidents, or even expected number by type, is not sufficient for traffic safety analyses. Risk estimates are required, as a basis for good comparisons. A combination of conflict studies and volume counts enables detailed risk estimates.



## Conflict Studies Combined with Other Studies

Combined with other data sets, the conflict technique is an efficient tool for analysing traffic safety problems for specific sites or road user groups. The most obvious strength of the technique is for quickly generating efficient countermeasures.

The conflicts do not only reflect the number of accidents well, but also their nature. The process of a conflict is almost identical to that of a compatible accident. The observations can therefore be used as a basis for explaining how these situations occur.

## Problems with Accidents as a Measurement

There are many reasons why accidents are not a good measurement for describing the traffic safety condition. One of the problems is that the number of accidents at a specific site is usually small. Small accident numbers go hand in hand with large random variations. Many years have to be included to get a good picture of the situation. This means that many extraneous factors are changed during the period of observation. Another problem is that many accidents are never reported to the police. The share reported varies from site to site and between different road user groups. A third problem is that often a countermeasure is introduced at a site because the number of reported accidents there has been large. A drop in the number of accidents may be attributed either to a successful countermeasure, or to the fact that the period before the measure was introduced had a randomly high number of accidents.

## ICTCT

- an association where you meet other traffic safety researchers

Traffic accidents are a conspicuous problem, occupying researchers in many countries. Everyday about 15 million people are injured in traffic, 500 000 of these fatally. Research focusing on this problem has led to transnational co-operation. Today, ICTCT – The Association of International Cooperation on Theories and Concepts in Traffic Safety – is an organisation spanning the whole world. URL: <http://www.ictct.org/>